Electrical World

The consolidation of ELECTRICAL WORLD AND ENGINEER and AMERICAN ELECTRICIAN.
Published by McGraw Publishing Company, Inc.

Vol. 63 NEW YORK, SATURDAY, MAY 2, 1914 No. 18

Monopoly in Utility Service

The Public Service Commission of Pennsylvania has rendered decisions upholding as desirable the principle of monopoly in public utility service. In so doing it takes the same position that most of the other commissions hold on this question. That is to say, it decides that it is unwise to permit two companies to do in competition what one existing company serving a territory is able to do. The grounds on which such a policy is defensible are reasonable and economic. The history of public utility companies in various parts of the country proves the case. Generally a competing plant is absorbed by the existing company whose rates it demoralized and whose business it tried to get. The public has been so short-sighted in the past as to see only the lower rates which the competitor promised and to fail to see that a consolidation was inevitable after an uneconomic rate war had demoralized the business. After such a consolidation there are two plants and two capital accounts upon which the public is expected to pay a return. The theory of regulation by the public is that the monopoly furnishing the service shall be protected from destructive competition. The companies, on their part, are not without obligations when they accept this theory. They owe it to the public to give as good service while enjoying protection as a monopoly as they would give if they were under the spur of competition.

Activity in Manufacturing

The annual report of the General Electric Company may be taken as fairly representative of conditions in the manufacturing part of the industry. It is, therefore, encouraging to note that comparison of the figures for 1913, given in last week's issue, with the reports of previous years shows a much greater volume of business. The increase in the amount of sales billed in 1913 as compared with 1912 is 19.4 per cent. Favorable as this record is, it is not so good as that of 1912, which showed an increase of 26.7 per cent over 1911. That the business now is less sensitive to the changes in general business conditions than it was in earlier years is a fair conclusion from a consideration of these figures as compared with the record of 1911, which showed a slight decrease, amounting to 1.5 per cent from 1910. The amount of sales billed in 1913 was 51.3 per cent greater than in 1911. At the same time it is evident that signs of a let-up were manifest at some time in 1913 because the increase in the value of orders received was 8.6 per cent, or, roughly, less than one-half of the proportionate percentage increase in amount of sales billed. There was thus a time during the year when the new orders did not gain so rapidly as the filled orders over the preceding year. This is less significant than it would have been a few years ago. With the increasing diversity of uses for electrical energy and with the central stations working steadily toward a more universal application, it is reasonable to predict a measure of stability in the electrical manufacturing industry that is not common in most other manufacturing lines.

Improving a Small Plant

The changes and rehabilitations effected in some of the great central stations of the country are most impressive in their magnitude, yet oftentimes they do not represent a finer ingenuity or a greater degree of resourcefulness than the changes which have to be carried out in bringing a small plant up to date. It is the small plant which is typical of the ordinary requirements of the electrical business; it represents average conditions of load and requires more than average skill to bring into a state of maximum productiveness. The account published in this issue of the work done in rehabilitating the plant at Alliance, Ohio, should interest many practical engineers and managers. Like most plants in places of moderate size, the Alliance station gradually grew from nothing in particular to a plant carrying a considerable and rapidly increasing load, until finally complete reconstruction without interruption of service was the problem which presented itself. The plant was originally without water for condensation, and no good water supply was available without so considerable a change in location as would involve serious difficulties. Therefore the cooling tower was resorted to for the betterment of steam economy. In passing from the old engine plant to a modern outfit of turbo-generators it was necessary to provide a new boiler plant, to move and turn around the stack, and make a suitable arrangement for the turbines as well as shift and entirely reorganize the switchboard without interfering with the service. To carry out these changes while building a new station on the same site as the old one was no easy matter, and the first step was to build a temporary sheltering house around the old station and inside the location of the new one. Thereafter apparatus could safely be moved around the old station while the new walls were going up on the outside of the intermediate one. Gradually the new equipment went into place, and the old equipment was shifted to the new location with an interruption of service of only two hours at a convenient time one Sunday.

The station now contains a 1750-kw equipment in two modern steam turbines, with a first-class equipment of water-tube boilers and a completely reorganized switchboard of the latest type. An unusual feature of the boiler-room outfit is that two of four boilers are equipped with natural-gas burners, the other two burning coal with mechanical stokers. It is interesting to note that at present prices of fuel the coal-fired boilers are depended upon for the bulk of the work, the gas-burning boilers being kept warmed up and used when necessary. At a pinch they can be pushed to the working pressure of 150 lb. in about twenty minutes. The study of this work of rehabilitation may be of considerable service to the many engineers who in the course of the next few years will have to undertake similar work.

Alternating-Current Electromagnets

The fundamental law of electromagnetic attraction between opposing polar surfaces, as stated originally by Maxwell, is very simple; namely, that per unit of area it is directly and simply proportional to the square of the flux density, and that it is directed along the stream lines of flux density. If, therefore, a direct-current electromagnet is provided with such a magnetic circuit that the flux density in the air-gap is uniform and directly across the gap, the total pull between the polar surfaces becomes definitely determined when the flux density is known. Actually, however, when the iron becomes so nearly saturated that the magnetizing force H becomes appreciable with respect to the flux density B the realizable pull falls below the electromagnetic tension existing along the flux paths. If, for example, a lifting solenoid contained a movable iron-core plunger which became completely saturated, magnetically, before the end of its stroke was reached, the lifting force on the plunger would cease and it would behave from that point like a core of lead; since, by hypothesis, no increase in flux could occur in the air-gap by any further advance of the core. As, however, complete saturation is never attained throughout the length of a plunger core, such a state of complete magnetic stagnation and standstill cannot be produced in this manner, although it may be brought about in other ways. Again, the magnetic leakage in an electromagnet may cause the flux density in the air-gap to disperse and weaken, so that the direct-current electromagnet may behave in a seemingly very erratic fashion in respect to its tractive force, owing to the combined effects of magnetic leakage, saturation and contour of the polar surface.

The laws of action of a direct-current traction magnet are, however, simple and few by comparison with those governing any simple alternating-current electromagnet. Here the magnetic pull is never steady over more than an infinitesimal interval, so that, under a steady tractive load, there is a tendency for the magnet to release its load altogether at zero-flux moments, and then to think better of its laxity and take up its load again—twice in each cycle. This makes the pull chattering and unstable. The reactance and impedance of the magnet also change when the air-gap changes, so that under constant impressed emf the exciting current changes of itself, in a somewhat irregular manner. Eddy currents set up in the magnetic circuit, or in adjacent metallic parts, develop demagnetizing forces in a very complicated manner, associated with what is ordinarily termed a "skin effect." One may thus understand the attitude of mind of the magnetician who expressed the desire that his enemy should be compelled to compute the complete electromagnetic behavior of an alternating-current electromagnet to the uttermost detail. In an article in this issue Mr. Charles R. Underhill outlines some of the characteristics of a comparatively simple form of alternating-current electromagnet employing different lengths of stop-gap, an attempt being made to co-ordinate observation with predetermination.

A Milliampere Series Transformer

The ordinary form of oscillograph is a very valuable implement in exploring the behavior of electric circuits, but it has its limitations in regard to the strength of current which it can measure satisfactorily. When the current is less than, say, 20 milliamperes, the wave recorded on the oscillograms is of too small an amplitude to give satisfactory indications.

In one of the papers at the Washington meeting of the A. I. E. E. last week Mr. Edward Bennett described the design, construction and application of a special small series transformer for use with an oscillograph in such a manner that a primary current of about 200 microamperes can be conveniently recorded, or about the hundredth part of the current ordinarily required. By this means the charging current of a single aerial-line insulator under moderately high-tension voltage, becomes readily recordable, and various other relatively feeble alternating-current phenomena become capable of oscillographic analysis.

Some of the difficulties which presented themselves in the design of the apparatus possess considerable practical interest. The new series transformer requires manifestly a large number of turns in the primary winding, which is stated to contain more than 3 km of fine enameled copper wire. Such a winding tends to bring successive layers of the copper wire into close proximity, their separation being merely two thicknesses of enamel; so that if the successive layers develop a considerable difference of potential they virtually form a condenser of very appreciable capacity. By successive transition from layer to layer it is evident that high-frequency harmonics might find a condensive shunt through the aggregate capacity of the winding, and thus fail to develop a proper proportion of secondary current through the oscillographed vibrator. This difficulty was finally remedied by sectionalizing the fine-wire winding.

A marked advantage and merit of the paper is that the dimensions and data for this transformer are given entirely in the metric system, a procedure which greatly aids the reader in this as well as in other countries. It is greatly to be desired that this procedure shall be generally followed in all papers presented to engineers.

The oscillograms appended to the paper illustrate effectively some of the feeble-current oscillographic investigations attained by the use of the apparatus. In particular, they seem to show that when the voltage on a suspension insulator is raised to such a point that streamers occur over the insulator surface these streamers set up groups of oscillations with some 3000 cycles per second, commencing shortly after the maximum or crest voltage in each alternation.

The new apparatus extends appreciably the range of voltage and current over which oscillographic records can be secured. High-voltage oscillograms are already well known. High-current oscillograms are no novelty in so far as they merely introduce a non-inductive shunt in the apparatus, but low-current oscillograms offer a new field of usefulness.

Bulk Electric Supply for London

It is very encouraging to note all over the world the increasing appreciation of the economies incident to the supply of electricity in bulk. The time has gone by when isolated small stations can make a good economic showing in face of the steady public pressure for lower prices. The great stations of this country have for years past been working at the economics of wholesale supply, and the excellent results obtained have served as an admirable example elsewhere. Now London seems to be awaking to the situation, and the present London electric supply bill may fairly be said to be chargeable in no small degree to the good example set on this side of the water. Incidentally, it may be remarked that one of the consulting engineers is an American long distinguished for his knowledge of large enterprises, and particularly familiar through long residence with the London situation. Speaking broadly, London needs consolidated electric supply more than any other city. It is full of small and large, private and public plants. They represent every phase of electrical development from the beginnings of the direct-current system to the last forms of alternating-current distribution. They run at all varieties of voltages and from all sorts and conditions of prime movers. Individually it is not too much to say that they are remarkably well handled within their limitations and succeed in turning out reliable supply at what seems in this country a very modest price, yet there is no doubt at all that the present movement looking toward stations able to furnish bulk supply can effect great economy.

It is little too early yet to predict what the final scope of the operations will be in case the bill runs the gantlet of the various legislative and other trials that will doubtless besiege it. Work may have to begin on a somewhat modest scale by virtually merging a number of private supply companies and arranging for the better and more economically equipped ones to furnish bulk supply for those less fortunate. It is not unlikely that the scheme once in operation will result in a general system of supply in which all the present sources of electrical energy will be united in a comprehensive scheme. There are good engineering reasons back of the plan which have particular application to a place like London. As things now stand, a perfectly possible station accident might easily leave a large district of the world's largest city absolutely without electrical supply until repairs could be executed. Some of the stations are now so situated with respect to the nature of their distribution that they could not easily get emergency service from neighbors who might be ever so willing and able to supply it so far as station equipment is concerned. Such an unfortunate situation could not arise in any large section of a city with distribution from several generating stations. The feeder system in America is so thoroughly organized and the arrangements for alternative sources of supply have been so completely worked out that more than a temporary break-down over a comparatively small area is almost unthinkable. The mere possibility of complete failure with no ready means short of actual repairs for keeping up the service is not pleasant to contemplate.

Even if the unified plan of supply now gradually being formed should not be able materially to reduce the cost of the product, the general security given by a completely worked-out system of distribution would be well worth taking a very considerable commercial chance to obtain. In point of fact, the experience shows plainly that when a unified system is secured the actual cost of energy drops in a very notable degree because a small station has limitations due to its size and to the nature of its load-factor which good management cannot overcome. It is well known to those who are familiar with London conditions that the union of a large group of plants in that metropolis would mean a considerably improved load-factor and that the diversity-factor conditions would be extremely advantageous.

For instance, in one prosperous and well-managed plant the load is largely residence lighting and the peak falls certainly two or three hours later than that in another station of not dissimilar size a few miles away. Indeed, we think it is safe to say that the diversity to be found in the London stations with respect to demand for output is exceptionally great, for London itself is the most diversified of the world's great cities. This means exceptional advantages in united supply. Eventually the situation might advance to complete unification with several very large stations situated at advantageous points and thoroughly linked together so that no failure of one could interrupt the integrity of the general supply. The scheme is a most interesting one, and if carried out by conservative managers and skillful engineers, as is likely to be the case, should result in a very great public benefit as well as in a not inconsiderable financial success.

The News of the Week

**Activities and Events in the Electrical Field—
Reports of Meetings—Commission Findings, Etc.**

New Rates in Los Angeles

An election on a proposition to issue city power bonds will be held in Los Angeles on May 8. The Board of Public Utilities has ordered a reduction in rates in Los Angeles. The lighting rate has been from 6 cents to 2.3 cents per kw-hr. The motor rate has been from 5 cents to 1.2 cents per kw-hr. The reduced rates are about 20 per cent lower.

Convention of Arkansas Association of Public Utility Operators

The seventh annual convention of the Arkansas Association of Public Utility Operators was held in Little Rock, April 21-23. At the closing session the following officers were elected: Mr. C. J. Griffith, general manager of the Little Rock Railway & Electric Company, president; Mr. W. L. Wood, Jr., of the Southwestern Gas & Electric Company of Texarkana, first vice-president; Mr. H. C. Hoagland, general manager of the Fort Smith Light & Traction Company, second vice-president; Mr. W. J. Tharp, auditor of the Little Rock Railway & Electric Company, secretary-treasurer.

Program of Pittsfield A. I. E. E. Meeting

The general subject for discussion at a meeting of the American Institute of Electrical Engineers to be held in Pittsfield, Mass., on May 28 and 29 is "Relative Advantages of Star and Delta Connections." The following papers will be presented: "Experiences with Line Transformers," by Mr. D. W. Roper; "Experience of the Pacific Gas & Electric Company with the Grounded Neutral," by Messrs. J. P. Jollyman, P. M. Downing and F. G. Baum; "Influence of Transformer Connections on Operation," by Mr. Louis F. Blume, and "A Study of Some Three-Phase Systems," by Mr. Charles Fortescue. The headquarters for the meeting will be at the Maplewood Hotel.

International Electrotechnical Commission

At the Berlin meeting of the International Electrotechnical Commission, held in September, 1913, an account of which appeared in our issue of Sept. 20, 1913, it was agreed that meetings of the (international) special committees should be held in Madrid toward the close of the present month. These special committees deal with symbols, standardization rules for electrical machinery, nomenclature and prime movers for electrical plant. It has been found impracticable to hold these meetings at the present time, and they have therefore been postponed until the autumn. It is probable that they may take place in London. This extension of time will enable the national committees to consider in detail the various proposals which will be discussed by the special committees, and it should have the additional advantage of simplifying the work of the delegates.

Activities of Society for Electrical Development

The Society for Electrical Development, Inc., in selecting its staff has chosen, among others, Mr. John P. Mallett, whose duties will be to investigate the application of electricity to the various industries and to suggest further applications. The information thus gathered will be filed and indexed for the benefit of the members of the society, and in addition to other available information on the subject of the uses of electricity will be taken care of by the Commercial Exchange Bureau, which will be in charge of Mr. Theodore Dwight. Mr. James Smieton, Jr., has been engaged as office manager and acting secretary-treasurer of the society. Other members of the staff are being secured, and the society expects to commence its active work this week. Among the important companies which have recently joined the society is the Edison Electric Illuminating Company, of Boston, Mass.

Burdensome Taxation in Colorado

Valuations of all corporations in Colorado for taxation are now determined by the State Tax Commission of that State. This commission was created by the last Legislature. Heretofore taxes have been levied on a one-third valuation, whereas at the present time they are levied on the full valuation. Valuations have been fixed by the new commission at an amount which the commission undoubtedly thinks is fair. However, the actual result has been a very large increase in the taxes to be paid by the public utility corporations of Colorado for 1913, as compared with those for former years. It is asserted that these taxes will amount to about 10 per cent of the gross income of the utility companies. It is declared further that the 1913 taxes on some of the utility companies will run as high as 14.5 per cent of the gross income for the year.

Convention of Mississippi Electrical Association

With a registration of more than sixty, the annual convention of the Mississippi Electrical Association, which is a state section of the National Electric Light Association, was held at Meridian, Miss., April 27 to 29.

Mr. W. E. Baskin opened the sessions with an address of welcome on behalf of the Meridian Light & Railway Company, the host of the convention. President W. F. Gorenflo, of Gulfport, then called on Mr. N. P. Bissett, of Hattiesburg, who spoke on "Liability Insurance." On Tuesday Mr. R. M. Ellis, of Selma, Ala., president of the Alabama Electrical Association, read a paper on "Lubrication," which was discussed by Messrs. A. P. Patterson, of Meridian, and W. A. McWhorter, of Atlanta. Mr. Charles M. Rogers, of Meridian, also spoke on boiler operation and efficiency. Messrs. W. F. Gorenflo, R. M. Ellis and A. H. Jones, of McComb, joined in the discussion. On Tuesday afternoon Mr. L. W. Wade, of Vicksburg, presented a paper on "Short Cuts in the Office of a Small Electric Plant." On Wednesday Mr.

R. E. Perry, of St. Louis, Mo., gave an illustrated talk on nitrogen-filled tungsten lamps.

Officers were elected as follows: President, Mr. A. H. Jones, of McComb; vice-president, Mr. Charles Hay, of Columbia, S. C.; secretary-treasurer, Mr. H. F. Wheeler, of Hattiesburg. The executive committee comprises Messrs. R. B. Claggett, of Greenville; A. B. Patterson, of Meridian; W. F. Gorenflo, of Gulfport; E. P. Booth, of Vicksburg, and R. H. Smith, of Jackson. The next convention of the association will be held at Hattiesburg on April 12 to 14, 1915.

Progress of the Panama-Pacific International Exposition

The accompanying illustration shows a part of the main exhibit section of the Panama-Pacific International Exposition, taken from the dome of the Palace of Education. The buildings shown comprise a central group of eight main exhibit palaces, four of which face San Francisco Harbor on the north and four face the South Gardens, on the right of the illustration. The Palace of Education is the southwest building of the group. Dividing the group north and south are three great courts and their approaches. The court seen in the photograph is the Court of the Four Seasons. Further to the east is the great central court, the Court of the Universe, and still further is the Court of Abundance. The walls of the exhibit palaces, forming the sides of the courts, are screened by colonnades, some of which may be seen in the photograph. Following the line of the colonnades one comes to a great esplanade upon the shores of San Francisco Harbor.

PANORAMIC VIEW OF THE PANAMA-PACIFIC INTERNATIONAL EXPOSITION BUILDINGS, SAN FRANCISCO

Labor Exchange Proposed by National Commission on Industrial Relations

Plans for legislation by Congress to do away with the evils of non-employment have been announced by the members of the United States Commission on Industrial Relations.

The proposed legislation would establish a National Bureau of Labor exchange in connection with the Department of Labor, with a central office in Washington and branch offices in other cities, and with a clearing house for each of several districts into which the country would be divided. The bureau would have power to establish and conduct free public employment offices.

The bureau's most important service would be to gather and distribute accurate information regarding the labor market in various localities. This information would be published in the form of bulletins at frequent intervals, circulated in such a way as to be available to every person in search of work and every employer seeking workmen.

Pacific Coast Convention A. I. E. E.

The 1914 Pacific Coast Convention of the American Institute of Electrical Engineers will be held in Spokane, Wash., in September, the exact date not having been set as yet. President C. O. Mailloux has appointed the following convention committee: Mr. D. L. Huntington, chairman; Mr. John B. Fisken, vice-chairman, and Mr. H. B. Peirce, secretary, all of Spokane, and Messrs. C. S. MacCalla, H. A. Shearer, J. W. Hungate and S. E. Gates, of Spokane; E. R. Northmore and C. G. Pyle, of Los Angeles, Cal.; G. R. Murphy and A. H. Halloran, of San Francisco, Cal.; G. P. Nock and R. F. Monges, of Portland, Ore.; S. C. Lindsay and A. A. Miller, of Seattle, Wash.; E. M. Breed and F. D. Nims, of Vancouver, B. C., and Max Hebgen, of Butte, Mont.

This committee is already actively at work through various sub-committees, including the committee on papers, of which Mr. John B. Fisken, chairman of the Spokane Section, is chairman.

The Northwest Electric Light and Power Association will hold its convention in Spokane at the same time, and the respective committees will co-operate and will probably arrange for one or more joint sessions. Committees on finance, transportation, and entertainment, composed of members of the Spokane Section, have been appointed and will co-operate with similar committees from the Northwest Electric Light and Power Association.

Empire State Association Discusses Workmen's Compensation Law

The spring meeting of the Empire State Gas & Electric Association was held at Medina, N. Y., on April 22 and was devoted mainly to discussion of the workmen's compensation law which goes into effect in New York State on July 1. About a hundred people representing fifty companies were present. The business session was held in the morning at the Alerts Club, and Mr. James T. Hutchings, Rochester, N. Y., president of the association, presided.

The first speaker was Mr. Cyrus W. Phillips, of Rochester, member of the New York State Assembly, who explained the law and answered questions of members in regard to the different features. Mr. Phillips outlined the history of compensation laws in other states and the developments leading up to the enactment of the new law in New York. He also explained at length the former compensation law, which was declared to be unconstitutional by the Court of Appeals, but was substantially the same as that which is to become effective on July 1 next. He called attention to the amendment of the constitution designed to permit the enactment of the law, but said that the constitutionality of the new measure has not been passed upon by the federal court. Mr. Phillips added that the rates

proposed by the New York law are much higher than in any other state and that its provisions are far more drastic.

Mr. Hutchings stated that Mr. J. Mayhew Wainwright, a member of the Compensation Commission, had been expected to address the meeting but that it was impossible for him to be present.

Mr. L. H. Belden, of Buffalo, discussed the subject from the standpoint of the liability insurance company. Mr. Edgerton Parsons, of New York, explained a plan for the formation of a mutual insurance company for the gas and electric companies of New York State. This plan is mentioned elsewhere in this issue.

Lunch was served to the delegates at the Alerts Club at the close of the morning session. Afterward the members were taken to the power house of the A. L. Swett Electric Light & Power Company and to other points of interest.

At the afternoon session Mr. J. Boardman Scovell, treasurer of the Lewiston & Lake Ontario Shore Power Company, discussed the legislation pending at Washington in regard to power at Niagara Falls. A brief report was submitted by the safety committee.

The next meeting will be held at Lake George, N. Y., on or about June 19.

Mutual Insurance Company Proposed in New York State

A number of electric and gas companies in New York State have joined in a plan for the formation of a mutual insurance company to carry their obligations under the workmen's compensation law of New York State, which is to take effect on July 1, 1914. A circular letter addressed to the officers and directors of the electric light, heat and gas corporations of New York State has been issued by the following companies:

Binghamton Light, Heat & Power Company, Canandaigua Gas Light Company, Despatch Heat, Light & Power Company, Eastern Monroe Electric Light & Gas Company, Homer & Cortland Gas Light Company, Ithaca Electric Light & Power Company, Ithaca Gas Light Company, Norwich Gas & Electric Company, Northern New York Utilities, Inc., Ontario Light & Traction Company, Oxford Electric Light Company, Rochester Railway & Light Company, Sayre Electric Company, Syracuse Lighting Company, Upper Hudson Electric & Railroad Company and Watertown Light & Power Company.

The circular says in part:

"The workmen's compensation law, which applies to the industry in which we are mutually engaged, will take effect July 1, 1914. Under it insurance for injuries to employees is compulsory. It is possible to effect this insurance in one of four ways—self-insurance, mutual insurance, stock-company insurance, and the State fund. It is conceded by those who have had experience in this matter that the State fund is the least desirable method to adopt, as the State is deprived of any right of selection among the companies which apply to it for insurance and it is obliged to accept every application made to it, regardless of how undesirable the hazard, and besides this the State assumes no responsibility beyond the fund actually created by the State.

"Self-insurance is impossible for any of us except the very largest companies, and is not practicable for them unless they have enough insurance to effect to establish an average on their own business. The stock companies are intimating rates at the present time which are and will be prohibitive.

"The only solution of the difficulty appears to us and to those who have advised us in these matters to be the formation of a mutual company to inter-protect ourselves. This company will be managed by the best insurance talent obtainable, at a reasonable expense ratio, and will confine its operation to the risks of the light, heat, power and gas corporations in this State. It is the purpose of this mutual insurance company to provide its members with insurance at cost by doing away with brokerages and middlemen's charges, making the surplus premiums returnable to employer members."

Mr. Frederic Culver, 25 Broad Street, New York City, has been appointed temporary secretary for the organizers.

I. E. S. Nominees

The board of nominations for the Illuminating Engineering Society has selected the following as nominees for officers for the 1914-15 term:

President, Dr. A. S. McAllister, New York; vice-president from the Chicago Section, Mr. F. A. Vaughn, Milwaukee, Wis.; vice-president from the New England Section, Mr. C. A. B. Halvorson, Jr., West Lynn, Mass.; vice-president from the Philadelphia Section, Prof. George A. Hoadley, Swarthmore, Pa.; general secretary, Mr. Joseph D. Israel, Philadelphia; treasurer, Mr. L. B. Marks, New York. Directors, Messrs. Ellice M. Alger, of New York; Harold W. Calvert, of Philadelphia, and V. R. Lansingh, of Cleveland.

The nominating committee for the New York Section of the society has selected the following nominees: Chairman, Mr. Norman Macbeth; secretary, Mr. Clarence L. Law; managers, Messrs. George W. Cassidy, Norman D. MacDonald, H. B. McLean, Frank E. Wallis and Percy S. Young.

The Philadelphia Section has issued the following ballot: Chairman, Mr. H. A. Hornor; secretary, Mr. L. B. Eichengreen; managers, Messrs. James Barnes, Douglass Burnett, George S. Crampton, R. B. Ely and F. H. Gilpin.

The nominating committee for the New England Section has made the following selection of nominees: Chairman, Dr. Louis Bell; secretary, Mr. S. C. Rogers; managers, Messrs. C. M. Cole, J. W. Cowles, Walter B. Lancaster, H. F. Wallace and R. C. Ware.

In Pittsburgh the nominating committee of the local section has made the following selection: Chairman, Mr. G. W. Roosa; secretary, Mr. S. G. Hibben; managers, Messrs. W. A. Donkin, H. S. Hower, Harold Kirschberg, E. B. Rowe and R. H. Skinner.

The Chicago Section's nominating committee has issued the following slate: Chairman, Mr. W. A. Durgin; secretary, Mr. H. B. Wheeler; managers, Dr. Harry S. Gradle, Dr. M. G. Lloyd, Messrs. F. A. Pinckney, Edward G. Pratt and Herman V. Willman.

Meeting of Georgia Electrical Contractors

At the first session of the Georgia Electrical Contractors' Association held in Atlanta on April 15 officers were elected, and Macon was selected as the meeting place for the association on May 26. At that meeting delegates will be named to represent Georgia at the national convention to be held in Detroit, July 15. The officers elected were as follows: Mr. R. M. Walker, of the Walker Electric & Plumbing Company, Rome, president; Mr. H. E. Lowe, of the H. E. Lowe Electric Company, Macon, vice-president; Mr. J. M. Clayton, of Atlanta, secretary; Mr. W. L. Baily, of Atlanta, treasurer.

Merz and McLellan on London Electricity Supply

On April 15 Messrs. C. H. Merz and W. McLellan submitted to a special committee on electricity supply of the London (England) County Council a report with recommendations on the electrical-energy-supply situation in London. They stated that the fundamental cause of the present unsatisfactory conditions is to be traced to the action of Parliament, which has encouraged the formation of small rather than large and more efficient undertakings, on the mistaken theory that competition is the best safeguard for the public. The solution of the difficulty is to be found in treating the metropolitan area as a whole and in anticipating the needs of the future. The authors stated that the best, and in fact the only complete and satisfactory, solution is the establishment of a new undertaking with such powers as will enable it to concentrate production, standardize and unify distribution and bring about the amalgamation of the various undertakings. They recommended that the London County Council promote a bill in the next session of Parliament, empowering some central body to set up an undertaking with powers of bulk supply and the means of gradually acquiring and amalgamating the different undertakings on commercial terms.

The conclusions arrived at as a result of their investigations may be summarized as follows: (1) The concentration of generating plants on sites down the river is the correct policy to begin with, both on technical and commercial grounds, deferring the question of generating part of the energy at the coal fields or elsewhere until both the load and the load-factor have grown. (2) In order to carry out this policy with the minimum waste of capital, a high-voltage three-phase primary distribution system at fifty cycles per second should be standardized for London as soon as possible. In this connection a standard primary voltage should be adopted at once for all new high-pressure mains. (3) If electricity is to be supplied for motor service and general domestic use at the lowest possible prices, it is also necessary, both for economical and other reasons, that the existing low-pressure distribution networks should, as a rule, not be extended but be supplemented by a new three-phase network. (4) The most satisfactory and economical method of achieving these results is the establishment of a new undertaking with such powers as will enable it gradually to concentrate production, standardize distribution, and bring about the amalgamation of all the various undertakings.

Hydroelectric Development with Massive Water-Wheels Near Spokane, Wash.

The accompanying illustration shows a view of the Long Lake development of the Washington Water Power Company on the Spokane River. The plant will consist of an ultimate installation of four 13,900-kva generators having a continuous overload capacity of 25 per cent. Each generator will be connected to an I. P. Morris waterwheel rated at 22,500 hp, the largest waterwheel thus far built. The station when completed will be the largest of the company. It is situated less than 30 miles west of Spokane. At that point the Spokane River passes through a box canyon the walls of which rise about 400 ft. above the river. A dam approximately 200 ft. in height is being erected across the river at that point, giving a fall of 170 ft. at the power house and backing up the water for 23 miles. Considering only 15 ft. of storage, the water thus held for reserve will be 2,695,000,000 cu. ft., all of which will be available not only for the Long Lake plant but also for the Little Falls station of the company, 4 miles below the Long Lake development on the same river. The dam being constructed at Long Lake is unique in that it will not only be higher than any other spillway dam now in existence but will at times of flood carry about 19 ft. of water over its crest. Three roller dams mounted upon the crest of the spillway will be used to hold the low-water level of the lake at the same level as at high water.

LONG LAKE DEVELOPMENT OF THE WASHINGTON WATER POWER COMPANY ON THE SPOKANE RIVER

The illustration shows a very recent view of the site. To one side is the spillway dam, the extreme left portion of which is completed. Temporary sluices in the center pass the flow of the river during construction, and behind the portion of the dam at the right are the headgates. Steel penstocks will lead directly over the barrier to the power house below. The walls of the latter are shown completed. The tunnel which was blasted out of the rocks to divert the river from its old bed around the bend while the dam was being constructed has been closed, and it is expected that the station will be in operation by the end of the year. The company will then have four hydroelectric stations on the Spokane River: Post Falls, Idaho; Lower Falls, city of Spokane; Long Lake, and Little Falls, in addition to a steam-turbine relay station at Ross Park within the city limits of Spokane on the Spokane River.

Mr. D. L. Huntington is president of the Washington Water Power Company, and Mr. C. S. MacCalla is general manager.

Joint Meeting of American Physical Society and A. I. E. E.

Under the auspices of its electrophysics committee, the American Institute of Electrical Engineers held a two-day meeting at Washington, D. C., April 24 and 25, in conjunction with the American Physical Society. The sessions were held in the new electrical laboratory of the Bureau of Standards, which was thrown open so that visitors might inspect its splendid equipment of instruments and apparatus. In addition a number of manufacturers, federal departments, universities, laboratories and individuals made special exhibits of scientific appliances and instruments.

The program of the American Physical Society comprised fifty papers, most of which were briefly abstracted by their authors. The session of Friday evening was devoted to the reading and discussion of three of the five papers presented by A. I. E. E. members, the remaining two being read by title. Abstracts of these papers will appear in a later issue. The feature of Thursday afternoon's session was an address by Sir Ernest Rutherford, F. R. S., on "X-ray and Gamma-ray Spectra." The speaker described some of his own experiments in spectrum analysis, using these extremely short wave lengths, and he showed a series of elements (with gaps for missing elements not yet discovered) based on the determinations of the X-ray method.

Many of the papers presented by members of the American Physical Society related to electrical subjects and of these a number were of interest to electrical engineers. Messrs. A. G. Worthing and W. E. Forsythe reported their experience in measuring the brightness of tungsten-lamp filaments with an optical pyrometer, noting the errors introduced by diffraction. Messrs. Jacob Kunz, J. Stebbins and W. F. Schulz described the use of photoelectric cells in astronomical measurements. Mr. C. W. Hewlett discussed the relatively greater conductivity of the air over oceans than that over land. Messrs. F. Wenner, E. Weibel and F. B. Silsbee described a method of measuring the time constants of low resistances, using pure mutual inductances. The same authors, with Mr. F. C. Weaver, also described a sensitive moving-coil galvanometer.

Mr. C. W. Waggoner recounted his experiments with using the muscle of a frog as a wireless detector. Mr. E. H. Hall outlined mathematically a theory of electric conduction to account for the increased conductivity of a metal when heated without being permitted to expand. Mr. F. A. Harvey showed how a recording ammeter in series with an electrode circuit may be made to indicate the uniform character of an electrolyte mixture. Dr. G. W. Middlekauff showed characteristic curves of tungsten lamps. Mr. H. L. Curtis reported his test of the leakage that occurs over hard rubber and other insulating materials. Mr. S. P. Farwell described the corona effects obtained by connecting a number of direct-current generators in series, obtaining in this way continuous pressures up to 10,000 volts. Prof. F. J. Rogers presented as "an electromagnetic puzzle" the fact that emf is developed in a wire carried through a tubular conductor carrying a current, although no flux be present within the tube. He also reported on tests made on a number of subjects to determine the toleration of a flow of direct current. In these tests he found that the subject invariably reported the greatest pain in the part of the body nearest the cathode. Dr. H. E. Ives described an absorbing fluid for eliminating color differences between lamps, and also exhibited a new form of flicker photometer. Messrs. Frank Wenner and Ernest Weibel discussed a method of testing potentiometers.

How Public Utility Investments Are Held

Before the Finance Forum of the Young Men's Christian Association in New York on the evening of April 27 Mr. W. H. Gardiner, of Henry L. Doherty & Company, New York, gave a talk on the subject "Investments in Public Utilities and How Held." Mr. Gardiner is statistician for the Doherty company.

The speaker gave $20,000,000,000 as a fairly close approximation of the face value of the railroad securities at present outstanding in this country, while the outstanding securities of those concerns which he classed under the head of public utilities—namely, gas, electric light and power, traction, telephone and telegraph companies—come to about $14,000,000,000. An idea of the comparative rate of growth of the two may be gained from Mr. Gardiner's statement that the former total has increased 20 per cent in the last decade, while the latter has about doubled.

The status of the holding company in connection with public utility financing was then taken up by Mr. Gardiner. Of a total of about $8,300,000,000 of stock of the various public utility companies now outstanding in this country, he said that approximately 75 per cent is controlled by holding companies. This concentration of control, he said, has been a natural result of the inability of small local interests to finance properly the necessary extensions of their closely held utility properties.

In the latter part of his talk Mr. Gardiner reviewed the gradual change in sentiment concerning security issues and described the real security back of these issues and the bearing of these tendencies on problems of new financing.

A point on which Mr. Gardiner laid special stress was that when there is new financing to be done there is no time to discuss the academic questions of whether or not securities should be sold below par and what is a fair rate of interest to allow. When the money is required, the thing to do is to get it as cheaply as possible, but to get it.

Terminal Freight Congestion and Its Solution

A paper entitled "The Problem of Terminal Freight Congestion and Its Solution" was read before the New York Section of the Electric Vehicle Association April 24 by Mr. Fred A. Hortter, car accountant Boston & Maine Railroad. Mr. Hortter not only rehearsed the various causes of congestion at freight terminals and the defects of the systems now in vogue for handling the freight but also suggested a remedy for bettering the conditions.

The railroads have given much attention, Mr. Hortter asserted, to improving the so-called "long hauls" of freight from city to city, but it is only recently that the necessity for giving an equal amount of study to the so-called "short hauls," or teaming of freight from terminals, has been impressed upon the transportation interests. Investigation has resulted simply in emphasizing the defects of the systems employed, but whatever remedies have been suggested have mostly emanated from, and been put into practice by, the railroads themselves. These improvements have generally been to little purpose through the lack of co-operation between the carrier and the public and the inability of the railroads to control the operations of the teamsters and the truckmen.

For years, Mr. Hortter concluded, men of the motor-vehicle industry have been endeavoring to produce a better quality of street transportation. They have not gone far enough, however, and they have not endeavored to

change the methods. The remedy is apparent. It lies in the co-ordination of the railroad and highway movement of merchandise and in a collaboration of the railroads and the teaming interests.

In the discussion following the presentation of Mr. Hortter's paper Mr. W. P. Kennedy recited four factors that entered into the problem of handling freight at terminals, these being the railroad, the teamster, the merchant with his own teaming facilities, and the electric-vehicle man. The railroads, the speaker declared, are the exemplification of practically everything that is efficient and the result of scientific management, with the exception of the handling of freight at terminals, where their methods are archaic.

Mr. C. A. Shirley maintained that in his experience the railroad was always willing to co-operate. He suggested that much of the congestion could be avoided by shipping goods at night.

Mr. H. Cowen declared that railroad men were necessarily cautious and careful, and above all the efficacy of a new device had to be proved before its adoption.

Mr. R. M. Lloyd suggested that the railroads buy their own trucks and deliver the goods themselves, thereby eliminating the congestion in a way best suited to their own interests. Mr. Hortter in reply, however, called attention to the increasingly high cost of labor and materials and the difficulty of obtaining the money which would be necessary to invest in a large number of new trucks.

Cleveland Company Appeals to State Commission in 3-Cent Rate Case

An appeal has been made to the Public Utilities Commission of Ohio by the Cleveland Electric Illuminating Company in regard to an ordinance passed by the City Council of Cleveland on March 16, 1914, fixing a maximum rate for illuminating electricity of 3 cents per kw-hr. In a statement issued in Cleveland in regard to the matter, Mr. Samuel Scovil, president of the company, says:

"The fact that the city is a competitor, actively engaged in soliciting business from the public which this company serves, in equity disbars it from fixing the terms upon which its competitor may do business.

"Under the laws of Ohio the State Public Utilities Commission has practically unlimited power to appraise the property and investigate the business of any public service corporation for the purpose of establishing just and equitable rates. These laws have been in force three years. At any time during that period the rates of the illuminating company have been subject to regulation and adjustment, if, upon investigation by this expert public body, they were found to be unreasonable. Instead, however, of appealing to the commission for an expert and impartial adjustment of rates, the city elected to engage in competition and has authorized the issue of bonds for that purpose to the amount of $2,500,000. These bonds are issued on the faith and credit of the people and are payable both as to principal and interest by taxes levied on the property of non-users as well as users of electricity.

"The ordinance fixing 3 cents as the maximum price for electric light was passed by the Council without any investigation, expert or otherwise, as to whether it is a reasonable and proper rate. The new $2,500,000 municipal plant is not yet completed and therefore no data to justify the 3-cent rate could have been obtained from that source, while the city's experience with its lighting plants in Brooklyn and Collinwood does not furnish a reasonable basis for a rate of 3 cents for residence lighting.

"The illuminating company pays annually large sums for the privilege of doing business under the laws of Ohio and the ordinances of Cleveland, and for such protection to its property and business as those laws and ordinances afford. Last year these payments amounted to $303,743 and for the current year they will exceed $350,000. It will cheerfully abide by any just and equitable rate or service regulation which may be fixed after due consideration by the legally constituted authorities as provided by these laws."

Bush Terminal Meeting of New York Electrical Society

A meeting of the New York Electrical Society was held on April 22 at the Bush Terminal, Brooklyn. After the meeting was called to order by President H. H. Barnes, Jr., Mr. R. E. Ireton, educational director of the Bush Terminal Company, gave a brief description of the notable features of the terminal. Mr. T. I. Jones also addressed the meeting and described some interesting points in regard to the electric energy supply. The electrical energy for the operation of the plant is obtained exclusively from the mains of the Edison Electric Illuminating Company of Brooklyn. There are two substations on the premises, each with 2000 kw in direct-current machinery for the supply of energy at 125 volts and 250 volts and 1500 kw in rotary converters, which supply 500-volt service to operate a freight railroad on the premises. The energy is received at 6600 volts, three-phase, twenty-five cycles.

The energy supplied is used for lighting and nearly every conceivable motor service. Practically all the occupants of the model factories with their diversified manufacturing products use electricity. It is interesting to note that one of these factories is operated by a German concern making wire-drawn tungsten lamps in this country. The Bush company operates all its elevators, hoists, cranes and many ingenious labor-saving devices by electricity. A freight line connects all parts of its enterprise, the motive medium consisting of three 100-ton electric locomotives. A trolley line is operated on the premises for carrying passengers from one part of the plant to another. An elaborate and extensive fire-alrm system is also operated.

One of the interesting features of the equipment is the storage-battery crane trucks and baggage carriers. The batteries are charged at night. They are readily portable, so as to avoid the necessity for long cord connections and numerous outlets on piers. The lighting of the piers is accomplished almost exclusively by flaming-arc lamps, but the new pier will be illuminated by 500 250-watt incandescent lamps.

This remarkable pier, recently constructed to prepare for the increase in trade expected to follow the Panama Canal's operation, was the object of particular interest to the delegation. It is 1450 ft. in length, 270 ft. in width and more than 50 ft. in height. Its two floors comprise an area of 15 acres. Six large ocean-going vessels may be accommodated at one time at this pier, and they may load and unload simultaneously. The American-Hawaiian Line, which has leased this pier, expects to handle 1,500,000 tons of freight annually thereat. The enormous range of warehouses along the bulkhead and the completely equipped railroad yard of the plant were other features inspected by the visitors.

The total electrical equipment rating in the Bush company's plant exceeds 15,000 hp, and the consumption of electrical energy during 1913 was more than 4,000,000 kw-hr.

Matters Affecting Niagara Power Stockholders

Mr. Edward A. Wickes, president of the Niagara Falls Power Company, refers in the annual report to stockholders for the year 1913 to several matters which materially affect the interests of that company. In that year there was an increase of 9.8 per cent over the previous year in the combined gross earnings of the Niagara Falls Power Company and the Canadian Niagara Power Company. Mr. Wickes says that the substantial increase in the operating revenues was made possible mainly by the completion of generating unit No. 7 in the Canadian plant, the release by expiration of the Burton law in March, 1913, of restrictions expressly imposed by Congress on transmission into the United States of electrical energy generated in Canada, and the substitution for the peak measurement of water diversion under the Burton law of the more practicable method indicated in the international waterways treaty of determining the rate of the daily diversion.

Mr. Wickes called attention to the fact that an appeal is now pending from the order of the New York Public Service Commission, Second District, made in April, 1913, reducing by 28 per cent the energy rates of the Cataract Power & Conduit Company in Buffalo, except rates for energy for railway purposes. A decrease in non-operating revenues of the generating companies is due to the fact that dividends of the subsidiary Cataract Power & Conduit Company and the Tonawanda Power Company have been stopped since this order was made.

As in previous years, various bills dealing with Niagara diversion and, Mr. Wickes adds, more or less drastically with the rights of the operating power companies at Niagara Falls have been introduced in Congress and the New York Legislature. The Legislature adjourned without enacting any bill upon the subject, and the bill of Mr. Cline, of Indiana, is still before the foreign affairs committee of the House of Representatives.

The board of directors is of the opinion that present conditions as well as public sentiment in Buffalo call for the consolidation of the two companies now distributing in that city Niagara power furnished by the generating companies. So far as may be, the Niagara Falls Power Company should refrain from engaging in the retail lighting and public distribution branch of the electric business by means of corporations which it does not wholly own and control. Its normal function generally should be the production of energy for industrial uses and its transmission in large amounts for distribution by others. In view of this and of the opinion of the Public Service Commission, an agreement has been made with the Buffalo General Electric Company to sell to it all of the 10,050 shares, constituting a majority, of the stock of the Cataract Power & Conduit Company owned by the Niagara Falls Power Company for 145, or $1,457,250, with interest on the purchase price from Dec. 1, 1913, at 6 per cent per annum. In payment the company is to take the first refunding 5 per cent bonds of the purchasing company for $1,005,000 at par with adjustment of interest in money, and the remainder of the purchase price, $452,250, is to be paid in money upon delivery of the shares. The Cataract Power & Conduit Company is to agree to set aside an annual sinking fund to pay its outstanding mortgage bonds at maturity. The Buffalo General Electric Company is to offer to purchase the minority shares of stock of the Cataract Power & Conduit Company at the same price and terms. The agreement is conditioned upon the consent of the Public Service Commission and the city of Buffalo.

Convention of Iowa Section, N. E. L. A.

The Iowa State Section of the National Electric Light Association and the new Iowa Electrical Contractors' Association met in joint session at Cedar Rapids on April 22 to 24. The program was as follows: Presidential address by Mr. A. L. Dodd, of Charles City; "The Society for Electrical Development," by Mr. J. M. Wakeman, of New York; "Co-operation of Contractors and Central Stations," by Mr. J. T. Marron, of Rock Island, Ill.; "Workmen's Compensation Law," by Mr. G. A. Wrightman, of Des Moines; "Features of the Operation of the New Keokuk Development," by Mr. A. D. Ayres, of Keokuk; "The Conduct of Public Utilities Under Commission Supervision," by Mr. F. W. Stearns, of Chicago; "High-Tension Lightning Protection," by Prof. A. H. Ford, of Iowa State College; "Facts and Factors," by Mr. A. Burt, of Waterloo; "Objects and Results of Affiliation with the N. E. L. A.," by Mr. E. W. Lloyd, of Chicago; "Rubber-Covered Wires," by Mr. J. E. Latta, of Chicago; "Is There a Saturation Point of the Sale of Electricity?" by Mr. J. S. Forbes, of Cedar Rapids.

An account of the meeting of the Iowa Electrical Contractors' Association is given elsewhere in this issue, and abstracts of the papers presented before the Iowa State Section and the discussion thereon will appear in a subsequent issue.

PRESIDENT RUFUS E. LEE

At the closing session it was decided to hold the next meeting of the association at Keokuk. Officers were also elected as follows: Mr. Rufus E. Lee, of Clarinda, president; Mr. W. H. Thomson, of Des Moines, secretary; Mr. W. A. Mall, of Belle Plaine, treasurer.

Mr. Rufus E. Lee, Clarinda, the newly elected president, is a comparatively young man. He started in the electrical business at Wahoo, Neb., upon leaving high school in 1892. In the fall of that year he went to Chicago, working as a wireman, and later helped to install power-station apparatus in Michigan. Returning to the State of Nebraska, he later installed lighting and telephone systems at Superior, and in 1902 went to Clarinda, Ia., obtained a franchise and started a 100-kw lighting station, known as the Lee Electric Light Company. In 1905 the Lee Electric Light Company was incorporated, a steam-heating system and a 150-kw generating unit being added to the station. By steps this property, of which Mr. Lee is manager, has grown till it now includes ice and cold-storage plants, a modern turbine station and 70 miles of transmission line, of which 32 miles is erected on steel poles.

Public Service Commission News

Pennsylvania Commission

In two decisions the Public Service Commission of Pennsylvania has declined to grant authority to companies to enter territory already served by existing public utilities. The petitions for authority to compete which were denied by the commission were those of the Schuylkill Light, Heat & Power Company, which desired to enter the borough of Ashland, already served by the Eastern Pennsylvania Light, Heat & Power Company, and of the Harmony Electric Company, which wanted to compete in Ellwood City with the Pennsylvania Power Company.

In its decisions the commission said: "Long experience has shown that while the temporary effect of competition between public utilities occupying the same territory is to secure lower rates, the final result is likely to be the absorption of one utility by the other and then an increase of rates to pay the expenses of the warfare.

"Vested rights and interests must be duly conserved and protected. The commission has no warrant to invite or permit limited competition anywhere unless the area and population served, the needs of the community or the prospects of the municipality, as based on its growth and development, can reasonably show that the public welfare demands it. This principle of protection must be extended to the public utility to the end that the individual citizens who have invested in its plant equipment in good faith may be duly protected in their interests."

New Jersey Commission

The Board of Public Utility Commissioners of New Jersey has issued an order recommending to the Public Service Gas Company the modification of its rule under which service is discontinued to a customer who has failed to pay his gas bill within the time limit but who has a deposit with the company in excess of the unpaid bill. The ruling was made in connection with the complaint of Mr. Charles Reincke, a consumer, who held that it was not reasonable for the company to give one day's notice of service discontinuance. In its decision the board says:

"The deposit is held to answer the default of the consumer, and whenever the consumer defaults in payment the fund may be resorted to. Its exaction cannot be justified on any other ground. Persons with credit and financial standing are not required to make a deposit. It is a sum of money in the company's hand, which is answerable for the payment of the consumer's account, whenever there is a default in the payment thereof. In this view the company should have applied so much of that fund as was required to cancel complainant's charge for the gas consumed."

Wisconsin Commission

The annual report of the Wisconsin Railroad Commission for the year ended June 30, 1913, has been submitted to the Governor. A total of 473 formal cases were heard, of which 156 were utility cases. A total of 1305 complaints were received, an increase of 210 over the previous year. Authority was granted for the issue of $40,655,832 in securities, as follows: Stocks, $8,288,332; bonds, $18,617,500; equipment trust certificates, $10,220,000; notes, $3,530,000.

A considerable portion of the report is devoted to a review of the scope of the commission as outlined by the statutes and also to an analysis of the vast amount of informal work performed by the commission while serving in the capacity of intermediary on matters of dispute over which the commission has no jurisdiction.

The Equitable Electric Light Company, of Lake Geneva, has been ordered to reduce its rates for electric lighting in Lake Geneva from a rate of 15 cents per kw-hr. to the following: Primary rate, 14 cents per kw-hr. for the first thirty hours' use per month of the active connected load; secondary rate, 12 cents per kw-hr. for the next sixty hours' use per month; excess rate, 8 cents per kw-hr. Consumers outside of the city will continue to pay at the old rate. The minimum bill is to range from a charge of 60 cents per month for loads under 1 kw to a charge of $2.25 for a connected load of over 5 kw. No change was made in the rates for energy or street lighting.

Oregon Commission

H. M. Byllesby & Company have been retained by the Eastern Oregon Light & Power Company to make a valuation of the property of the company in Oregon in connection with the filing of rate schedules with the Railroad Commission of Oregon.

District of Columbia Commission

The Public Utilities Commission of Washington, D. C., expects to make a valuation of the various public service corporations operating in the District of Columbia. According to the plans under consideration the work of valuation will be under the direction of Prof. Edward W. Bemis, of Chicago. Congress appropriated $100,000 for the expenses of the valuation. Although the date of July 1, 1915, is set for completion of the work, it is not believed that so much time will be required. Professor Bemis is to make reports to the commission of his progress each month. His staff will consist of a chief engineer, a chief accountant and other employees. The properties to be valued are the Washington Railway & Electric Company and subsidiaries, including the Potomac Electric Power Company, the Capital Traction Company, the Washington Gas Light Company, the Georgetown Gas Light Company and the Chesapeake & Potomac Telephone Company.

Indiana Commission

The Northern Indiana Gas & Electric Company, of Michigan City, Ind., has asked the Public Service Commission of Indiana for authority to publish a lower rate schedule for electric power used by electric railways operating in and about Laporte County, Ind. The petition was presented on the ground that the company could afford to furnish such power to nearby companies at lower rates than to companies farther from the generating plant, because of the lower cost of wires and poles used in transmission.

There is still much discussion in Indiana, particularly in labor circles, of the possibility that the next Legislature will create a board for the arbitration of industrial disputes.

The commission has not had to act on the situation brought up at Lafayette, where the lighting companies were engaged in a controversy with citizens regarding franchise provisions concerning rates. The controversy was settled without the action of the commission. Rates for large amounts for power were reduced. Other rates were not changed. The commission dismissed a petition which had been filed with the announcement that it had no power to go into the rate-making situation as it concerned the small consumers unless a petition should be filed taking up that side of the case.

The first annual report of the commission is being prepared. Statistics showing the different results of companies using meters entirely and companies using flat rates will be included. It will be shown that the total indebtedness of the utilities of Indiana, as a whole, exceeds the total stock capitalization of the companies. A comparison of electrical rates in all cities of the State will be a feature of the report.

Current News Notes

Central Station Offers $25,000 Toward Development of Wilmington, N. C.—At the meeting of the City Council at Wilmington, N. C., on April 17, Mr. Hugh MacRae, president of the Tidewater Power Company, offered to give $25,000 to a fund of $75,000 to be expended by a commission of three for the development of the city of Wilmington.

* * *

Standby Storage Batteries.—In an item entitled "Storage Batteries in Central-Station Service," on page 711 of the issue of March 28, by reason of a typographical error Mr. T. Milton, district engineer in Chicago for the Electric Storage Battery Company, was reported as saying that certain large standby storage batteries would carry over 400 amp, when the figure should have been 40,000.

* * *

Chicago Electrical Show.—Notwithstanding the fact that Chicago's seventh annual Electrical Show is still more than six months in the distance, there is a gratifying preliminary demand for space. The directors decided to make an early campaign owing to the intervening summer months, with the idea of getting contracts rounded up before the outing season gets here. The show is set for Oct. 31-Nov. 14, and Manager Homer E. Niesz has already secured most of the large electrical manufacturing companies as exhibitors, in many cases with larger space than they formerly used.

* * *

SOCIETY MEETINGS

Electric Club of Chicago.—At the weekly luncheon of April 23 the Electric Club of Chicago listened to an illustrated address by Major M. L. C. Funkhouser, second deputy superintendent of police, on the work of the Police Department in combating vice in various forms. An audience of about 300 was present, and much interest was manifested.

* * *

National Fire Protection Association.—The eighteenth annual meeting of the National Fire Protection Association will be held in Chicago from May 5 to May 7, with headquarters in the Insurance Exchange, Jackson Boulevard and LaSalle Street. The committee on signaling systems and the electrical committee will make their report at the morning session of May 7. Mr. Ralph Sweetland, Boston, is chairman of the former, and Mr. F. E. Cabot, Boston, is chairman of the latter committee.

* * *

Jovian Activities in Memphis.—Mr. J. A. Fowler, of Memphis, Tenn., was a visitor at the luncheon of the Chicago Jovian League on April 27. Mr. Fowler was called on for a speech, and he told of the activities of the Jovian League of Memphis. In that city it has been found that the proper way to instil enthusiasm into the local organization is to give the Jovians something to do. During the holiday season the League erected a large Christmas tree in a prominent location. It has also provided various forms of public entertainments, particularly for children, both white and colored. It entertained the Tennessee Electrical Contractors' Association at the recent Memphis meeting of that organization and is now planning an electrical show to be held in Memphis in June.

* * *

General Meeting of Engineers at Philadelphia.—The scientific and engineering men of Philadelphia are preparing for a meeting to be held the evening of May 15 on the Continental Hotel roof garden, at which many prominent engineers will give short addresses. The speakers who thus far have promised to be present are Dr. C. P. Steinmetz; Mr. Walton Clark, of the United Gas Improvement Company; Dr. A. C. Humphreys, president of Stevens Institute of Technology, and Mr. James Mapes Dodge, of Philadelphia. Prof. George A. Hoadley, of Swarthmore College, is chairman of the general committee; Mr. L. B. Eichengreen, secretary, and Mr. C. C. Tutwiler, treasurer. Other members of the committee are Dr. R. B. Owens, secretary of Franklin Institute; Mr. J. A. Vogleson, chief of the Bureau of Health; Mr. Joseph D. Israel and Mr. H. A. Hornor. Members of the national engineering and scientific societies of other cities are invited to join the gathering.

* * *

Safety Engineering as a New Profession.—On April 23 Dr. W. H. Tolman, director of the American Museum of Safety, delivered an illustrated lecture on safety engineering as a new profession before the association of employees of the United Electric Light & Power Company, New York. He called attention to the statements of some noted efficiency engineers regarding the importance of providing safe working conditions for employees as a means of increasing the efficiency of an organization. In quoting one of these men the speaker declared that human efficiency is increased by preventing the possibility of accidents, by insuring healthful working conditions and by promoting good will. Dr. Tolman said that it will not be long before safety engineering will be regarded as a profession just as necessary to the conduct of a business as efficiency engineering has come to be. The exhibits of the safety museum conducted by the Allgemeine Electricitäts Gesellschaft, Germany, and those of the American Museum of Safety were described quite in detail. Following Dr. Tolman, short talks were also given by Messrs. F. W. Smith, vice-president United Electric Light & Power Company, and Mr. Arthur Williams, president of the American Museum of Safety.

* * *

New York Jovians.—"The Fire Alarm System of New York City" was the general subject discussed at a meeting of the Jovian Order in New York on April 29. Fire Commissioner Robert Adamson, his associate Mr. Putnam A. Bates, electrical engineer; Mr. J. J. Carty and Mr. T. C. Martin were the chief speakers. Mr. Bates stated that during 1913 19,318 calls were received over the fire-alarm circuits, which have a total length of about 3500 miles. In the built-up sections of Manhattan the circuits are underground, but in Brooklyn, the Bronx, Richmond and Queens Boroughs most of the circuits are overhead. Overhead circuits are unreliable even with the very best of construction and should be superseded by modern underground circuits. Commissioner Adamson said that there is urgent need for reconstruction of the fire-alarm system, which should be placed wholly underground. He claimed that the city should own and control the underground conduits along the streets. The Board of Estimate will be asked to provide money for reconstructing the fire-alarm system practically in accordance with the plans made nearly twenty years ago by Messrs. Kempster B. Miller and J. J. Carty. Mr. Carty discussed the problems that have confronted the Fire Department for many years and expressed the hope that a proper solution is now at hand. He claimed that it is essential for the circuits to be underground, but stated that it is of no importance whether the conduits are owned by the public or by private companies. The attendance at the meeting exceeded 200.

Rehabilitating Electric-Service Station at Alliance, Ohio

Complete reconstruction and rearrangement of 1750-kw generating plant in a city of 16,000, involving service interruption of but two hours' duration

As the result of the thorough-going reconstruction recently completed at the power plant of the Alliance Gas & Power Company, the city of Alliance, Ohio, now receives electrical energy from a rebuilt generating station which is to all appearances a brand-new plant. In addition to the erection of a new building measuring 95 ft. by 110 ft. in over-all dimensions, the old generating switchboard and boiler-room equipment was all moved and a 1250-kva turbine unit was added. While the work of rebuilding was in progress the single actual service interruption was of but two hours' duration, and this early one Sunday morning when the load was very small. Among the properties of the Doherty Operating Company 1914 is known as "clean-up year," and the completeness with which the spirit of this slogan has been carried out at Alliance is typical of work elsewhere under the same management.

The beginning of co-operative effort in the city of Alliance, it is of some interest to note, dates back to the day when the city assumed its present name. Formerly there were three towns here—Mount Union, Lexington and Freedom—each under separate government, although geographically they were a single community. When the three towns joined under one city government the newly formed city was called "Alliance."

Story of the Reconstruction

The Alliance Gas & Power Company is the outgrowth of a pioneer public-service corporation, the Alliance Gas Light Company, organized in 1864. The original company has since undergone a number of reorganizations and changes in management, but the production of energy has been carried on in the same location ever since the installation of the first dynamo in the city, in 1886. In its infancy the electric plant was stowed away in a corner of a manufacturing establishment, but as the demand for the electric service increased, the generating station grew in magnitude and eventually crowded out the parent manufacturer, who was forced to seek a new site for his operations.

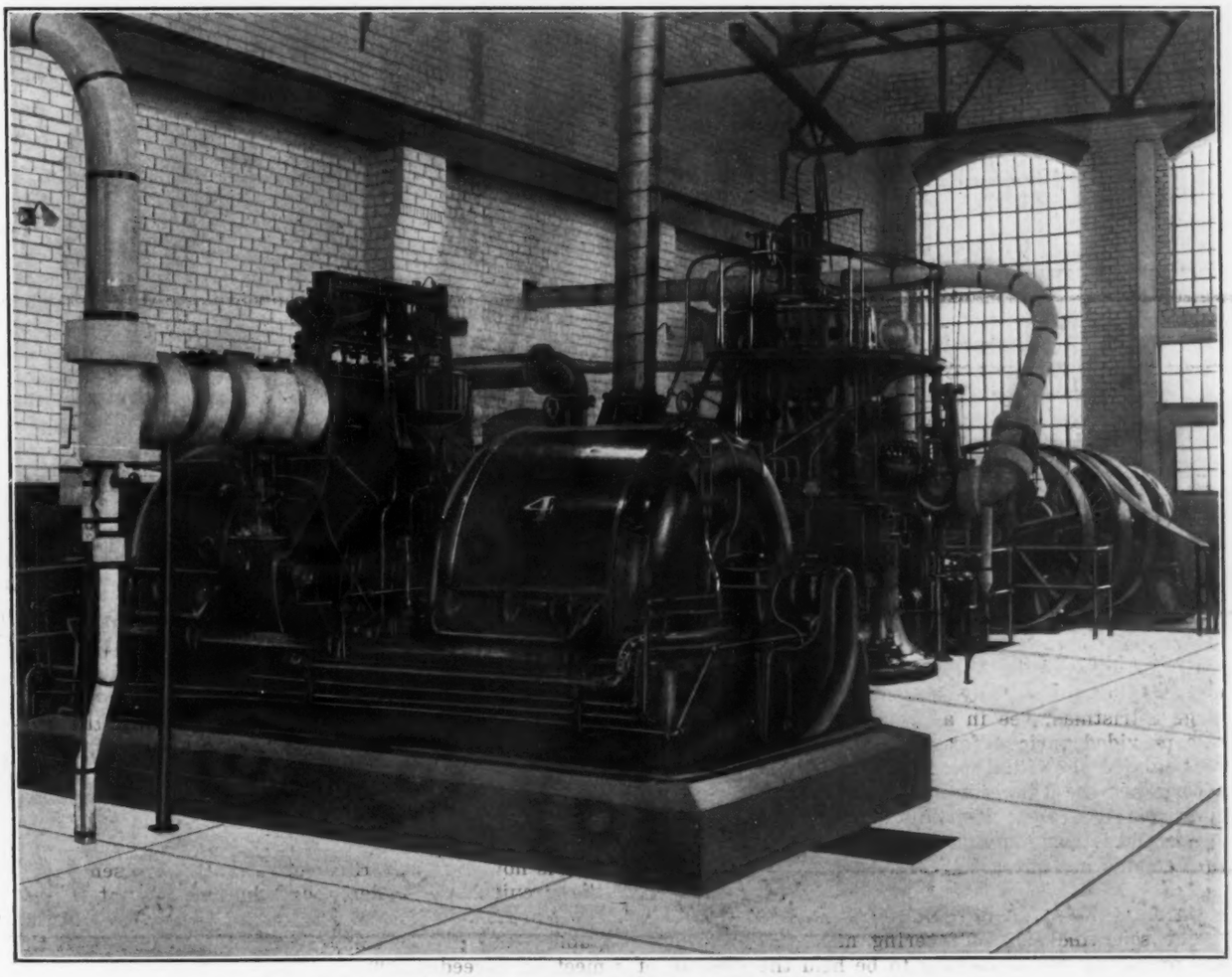


FIG. 1—AN ENGINE ROOM TYPIFYING PROGRESS IN PRIME MOVERS

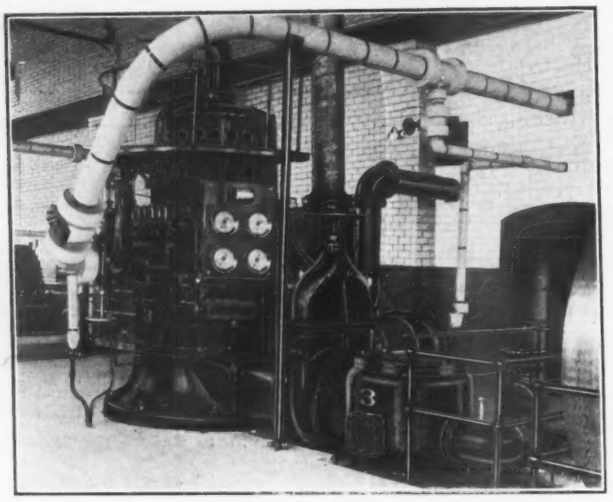


FIG. 2—VERTICAL TURBINE AND CONDENSER

Those in the electric-service business readily appreciate the problems that have had to be met in handling a growing load and in warding off possibility of embarrassment caused by outages due to overtaxing generating equipment. It was after completing one of those seasons of uncomfortable overload in the winter of 1911 that the owners decided to install equipment of greater rating. To house this new apparatus it was thought best that the old building, which had been patched up and added to as necessity demanded, should be replaced by a new one. The question of a new site was considered as the present location has no direct water supply, but it was decided that the advantages of the present site outweighed its disadvantages, and plans were prepared for an up-to-date building in the same place.

During the month of July, 1911, contracts were awarded for two 350-hp boilers, two Green chain-grate stokers and a Stocker cooling tower. The condenser was purchased to serve a 500-kw, 2300-volt Curtis turbine which prior to this time had operated non-condensing, and the cooling tower was designed to relieve the water situation.

During the month of August the work of rebuilding was begun. In the boiler room a number of old return-tubular boilers were removed to make room for the new boiler equipment, and as the new power house plans contained provisions for a coal bunker, a railroad track hopper and equipment for handling coal and ashes, work was at once commenced on the construction of this end of the building. While this work was going on in the boiler room, work on the cooling tower was pushed rapidly, an Ideal engine and a 150-kw, 2300-volt alternator were moved to new foundations, and the old foundation was removed to make room for the condenser. A condenser foundation was built, and while the condenser was being installed, a reservoir or cold well was dug in the engine-room basement on the same level with the cooling-tower reservoir, to provide a supply of cold water.

Change of Plant Ownership

The condenser and cooling tower were placed in operation in October, but fires were not built under the boilers until January, 1912. Preparations at this time were under way for the completion of the station during 1912. It happened, however, that the property was sold about this time to the Doherty Operating Company of New York, and construction work was temporarily discontinued.

The succeeding management took on so much new business during the year that the peak load of the holidays again brought uneasiness to those in charge, and the beginning of 1913 found the manager ready to contract for new generating equipment. The plans of 1911 were taken from the files and with a few changes and additions were adopted a second time. Work was resumed in the early spring.

The problems which faced the reconstructing engineers at this time were numerous. Service must not be interrupted. A new building had to be erected where the old one stood, although at all times it was necessary to protect the switchboard and other apparatus from the weather. This work was accomplished by erecting temporary walls outside the old structure, but inside the line of the walls of the new building, tearing away the old walls and building the new brick structure about the temporary building. When the roof beams of the new building had been laid in position holes were cut in the old roof to effect clearance and patched with tar paper till the new roof was completed. Switchboard panels were moved in pairs from the south end of station to a position along the last wall. The scheme used consisted in carrying all connections from two panels on one panel at the old switchboard site while one panel of a pair was being moved. These connections to a single panel in the new position, and then moving the second panel and again dividing the connections, completed the change. As soon as this removal was completed the new 1250-kva turbine was set in place in close proximity to the former switchboard site.

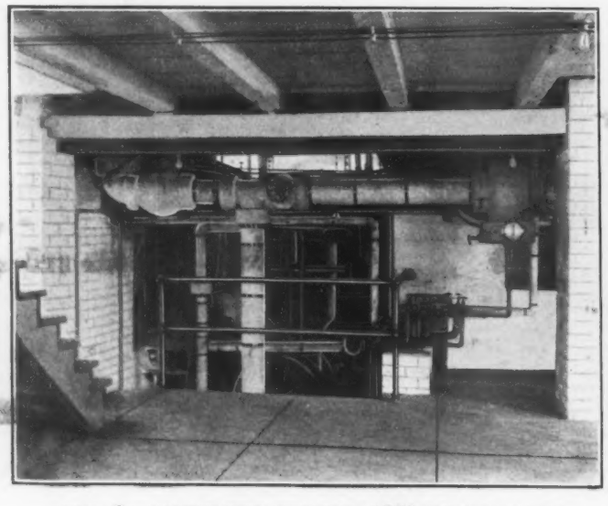


FIG. 3—CONDENSER PIT FOR 1250-KW TURBINE

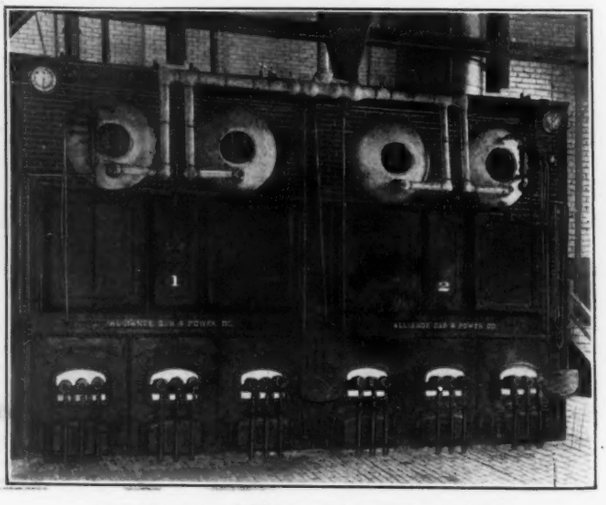


FIG. 4—TWO 350-HP GAS-FIRED BOILERS

At the same time a 6-ft. by 125-ft. steel stack was moved 28 ft. and received a quarter turn without mishap, and a basement was dug under the operating floor of the engine room. Shifting the mass of wiring before permanent leads were in place involved much labor, but each difficulty was met in turn, and the company is now the possessor of a neat and modern generating station.

Rearranged Generating Equipment and Switchboard

As it now stands the total rating of the generating equipment is 1750 kva. The largest unit recently purchased is a horizontal General Electric 1250-kva, 2300-volt, sixty-cycle, three-phase alternator operating at 3600 r.p.m. Exhaust from this machine is conducted through a Westinghouse LeBlanc condenser, the circulating pump and wet and dry-vacuum pumps for which are driven by a 75-hp direct-connected, non-condensing Westinghouse turbine. Arrangements were made in piping the exhaust steam from this auxiliary turbine to utilize the exhaust either in the feed-water heater or in the atmospheric stage of the main turbine. However, the latter method has been used entirely since starting the machine in October. An emergency trip ordinarily attached to the main steam line has been connected so that a valve in the exhaust steam line is automatically operated by the same trip. This precaution has been taken to prevent operation of the turbine on exhaust steam from the condenser auxiliaries after the automatic emergency trip has operated to close the live steam main.

The 500-kw vertical machine operates at 1300 r.p.m. and exhausts into a Westinghouse LeBlanc condenser the auxiliaries of which are driven by a 75-hp, 440-volt induction motor. Ordinarily these two turbine units carry the station load, but on Sundays or holidays when the load is very light it is sometimes transferred to one of the two 150-kw Ideal engine units. One of these machines is directly connected while the other is driven through a belt. They are maintained chiefly for breakdown service. Two 25-kw exciters, one motor-driven and one operated by a General Electric steam turbine, furnish energy for excitation.

The eighteen-panel Vermont blue-marble switchboard controls the four station units, six lighting and power circuits, two exclusive motor-service circuits, a sign circuit, a station auxiliary circuit and seven arc-lamp circuits, and supports a Tirrill regulator. Circuit-breakers and a system of double busbars are installed in the basement beneath the switchboard, the switching apparatus being of the manually operated, remotely controlled type. Each feeder circuit-breaker is equipped with an overload relay. Ground detectors mounted on an iron frame above the board are connected to the station buses.

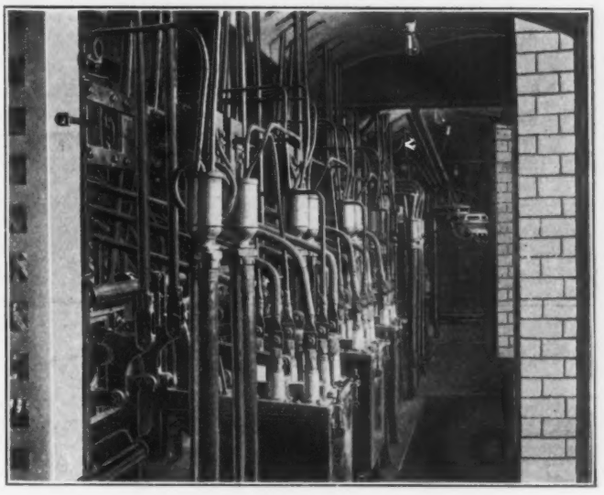


FIG. 6—HIGH-TENSION APPARATUS INCLOSED

Coal and Gas-Fired Boilers

Four 350-hp Babcock & Wilcox boilers carrying 150-lb. gage pressure are at present furnishing steam for the plant. Two of these boilers are equipped with natural-gas burners and the other two are arranged for coal burning with Green chain-grate stokers, each having an effective grate surface of 82.5 sq. ft. Slack coal from eastern Ohio mines is burned. Each battery is served by a separate, guyed steel stack, the one on the gas-fired boilers being 6 ft. in diameter and 125 ft. in height, while that for the coal-burning boilers is 6 ft. in diameter and 135 ft. in height.

Feed water is heated in a Cochrane open feed-water heater to a temperature of over 200 deg. Fahr. and is supplied to the boilers by two Platt Iron Works pumps of the duplex type. Either pump is of ample rating to supply the station at full load. High-pressure steam and water piping is all extra heavy with extra-heavy semi-steel flanged fittings. Long-radius bends have been used wherever possible, and all steam piping is covered with 1.5 in. of 85 per cent magnesia covering. Low-pressure material is employed in exhaust piping, and where practicable spiral-riveted pipe is used. Gate valves are in-

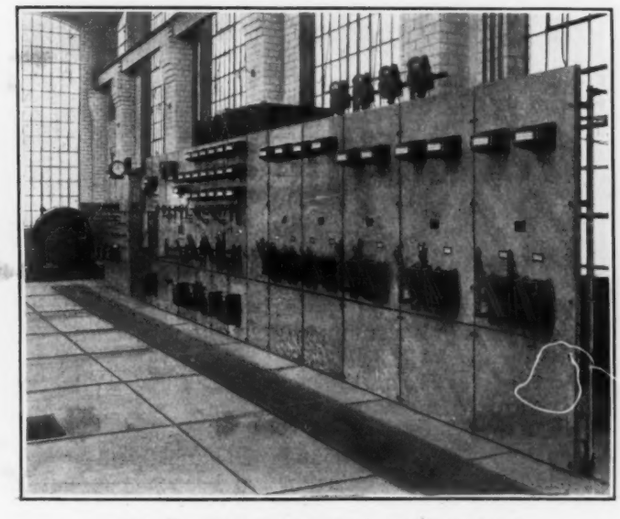


FIG. 5—EIGHTEEN-PANEL SWITCHBOARD

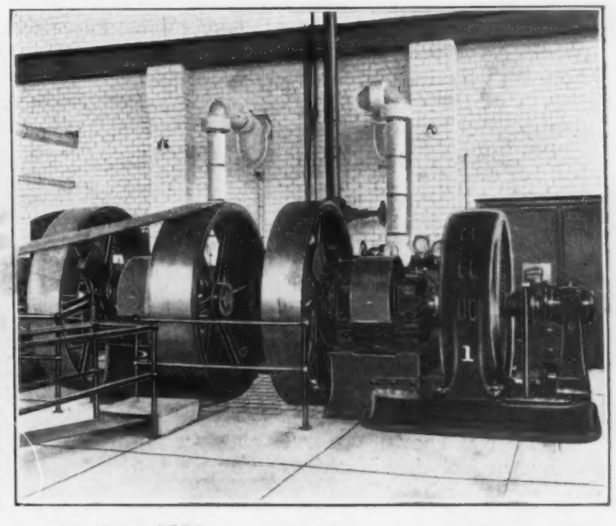


FIG. 7—BELTED AND DIRECT-DRIVEN ALTERNATORS

stalled in the steam header and its feeders so that it is possible to take any boiler from the line at any time or to sectionalize the header for repairs.

It has been found most economical to operate the coal-fired boilers as much of the time as possible, keeping the gas-burning units "floating" at all times by operating one burner beneath each unit. In times of emergency

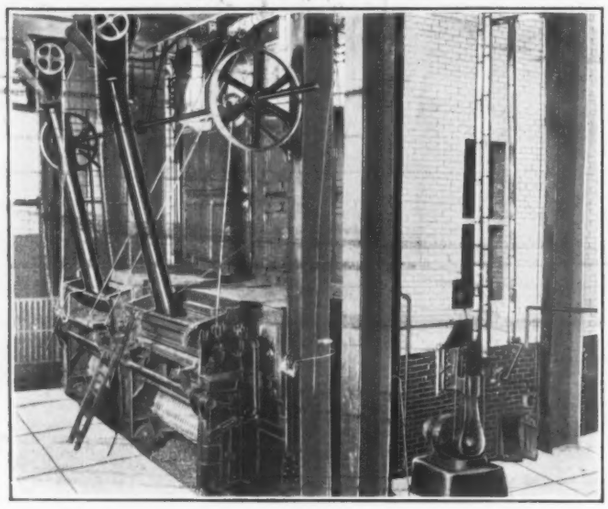


FIG. 8—COAL-BURNING BOILERS WITH CHAIN-GRATE STOKERS

these gas-fired boilers can be brought up to 150-lb gage pressure, all ready for operation, in approximately twenty minutes.

Industrial Railway for Coal Handling

Coal is placed on the company's private siding by the Pennsylvania Railroad and is dumped from the cars into a track hopper at the end of the boiler room. Industrial cars of 27 cu. ft. capacity are loaded at the bottom of this hopper and lifted by means of a freight elevator to coal bunkers from which coal is fed by gravity to the furnaces. The same cars are used to convey the ashes from the ash pits to a tramway leading to the ash pile. The elevator is belt-driven from a 15-hp induction motor and is reversed by shifting belts.

As the plant is without a natural water supply, the condensing water has to be used over and over again. The cooling tower is of the combination chimney and forced-draft type, the water being forced by the discharge pumps of the condensers to the top of the tower against a head of 39 ft., where it is distributed evenly in troughs over the cypress-wood filling. When the natural draft becomes insufficient to cool the water, two fans, each 11 ft. in diameter, are placed in operation. A 50-hp, 2300-volt induction motor drives these fans.

The Building and Its Interior Finish

A brick, steel and reinforced-concrete structure houses the generating equipment. Foundations and footings of the walls are of concrete, the foundation walls up to the height of the water table being built of Bedford stone. From this point up paving blocks laid in cement mortar are used. Red coloring was added to the mortar of the outside course, and all joints were neatly struck with a 0.75-in. round tool. The window sashes are of steel, and the roof and floors are of reinforced concrete, making the building fireproof throughout.

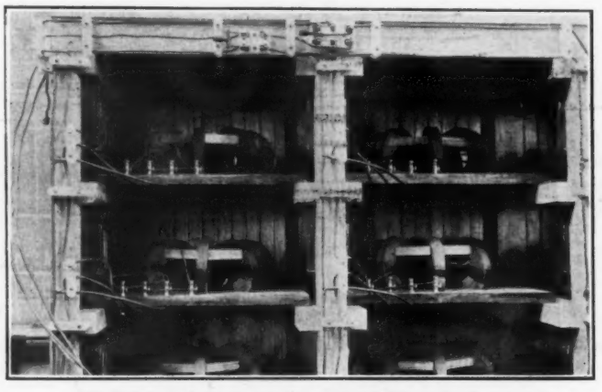
A material known as ferroinclave, manufactured by the Brown Hoisting Machinery Company, of Cleveland, was used on both roof and floors. On the roof the sheets of ferroinclave are laid flat on the steel purlins and coated with concrete top and bottom, while on the floors the sheets are arched between I-beams on 6-ft. centers. The coal bunkers, which form a part of the building on the boiler-room side, are supported by structural steel columns and trusses and are built of ferroinclave and concrete.

The interior of the building has been neatly and tastefully painted. A white cold-water paint was used on the upper part of the walls in both engine room and boiler room. In the engine room the white extends down to within 5 ft. of the floor, below which a border of brown oil paint has been applied. In the boiler room the white extends down to within 7 ft. of the floor, below which is a border of black. The concrete floors are all covered with a gray cement paint. All engines and generators have been coated with brown oil paint, giving a surface easily cleansed and presenting at all times a trim and neat appearance.

The manager of the Alliance Gas & Power Company is Mr. W. J. Rose, who is assisted by Mr. Edward Quillen, new-business manager. Mr. E. A. Wilder was in charge of the reconstruction of the generating station, and at present Mr. G. E. Morris is chief engineer.

Design for Artificial Transmission Line

An artificial transmission line of unusual compactness and flexibility has recently been completed at the Massachusetts Institute of Technology, Boston, by Mr. R. D. Huxley, a post-graduate investigator in the electrical engineering department. This artificial line is electrically equivalent to 800 miles of single-phase 500,000-circ.-mil copper line having a 10-ft. conductor spacing, or it may be used as a three-phase line 700 miles in length, with conductors spaced in an equilateral triangle. Shorter lengths may also be used by appropriate changes in the connections. The line is composed of thirty sections housed in a cabinet 12 ft. long, 5 ft. 6 in. high and 2 ft. deep, each section being contained in a compartment 20 in. long and 1 ft. high. Several typical sections are illustrated in the accompanying photograph. The line inductance is provided by eight coils per section centered on a circular axis, each coil being of No. 12 wire and wound to a diameter of 7 in. and a width of 1 in. The distributed capacity is provided by a condenser mounted on the side of each



SECTIONS OF ARTIFICIAL TRANSMISSION LINE

compartment. The method of securing mutual inductance effects by arranging the coils on circular axes is a novel feature of the design. With this equipment many phenomena of line operation may be studied and a great variety of resistance, inductance and capacity combinations secured, notably in connection with the production of resonance.

Characteristics of Alternating-Current Electromagnets

Behavior of uniformly wound plunger-type electromagnets with various lengths of stops throughout the entire coil when subjected to alternating currents. By Charles R. Underhill

THOSE who have experimented with alternating-current electromagnets having a fairly long stroke are well acquainted with the erratic behavior of the pull characteristics. When a short stop is used the pull falls off as the air-gap closes until, at a certain point it rises very rapidly. Again, if a long stop is employed, the pull increases enormously with a decrease in the length of air-gap. Sometimes the turns in the winding are distributed in such a manner as to maintain the pull with a short stop.

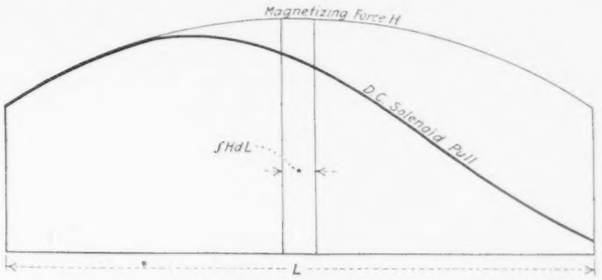


FIG. 1—DIRECT-CURRENT SOLENOID PULL COMPARED WITH MAGNETIZING FORCE

In this article will be discussed the general characteristics for various lengths of stops throughout the entire coil, which is assumed to be uniformly wound. The dimensions of the test electromagnets are the same as those given in the *Electrical World* for Jan. 31, 1914. In Fig. 1 is shown the magnetizing-force curve for a solenoid of length L which is excited with continuous current. Only the value of the magnetizing force within the physical limits of the coil will be considered.

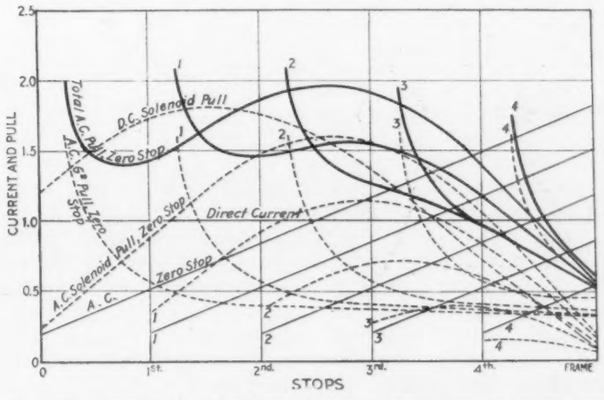


FIG. 2—GENERAL PRINCIPLE OF ALTERNATING-CURRENT ELECTROMAGNET CHARACTERISTICS

Furthermore, in referring to this figure in connection with plunger electromagnets, the ends of the coil will be considered as fitting closely against the inside of the frame. The "D.C. solenoid pull" curve is merely the magnetization curve $(B - H)$ of the plunger, with air return circuit, multiplied by the magnetizing force; since the solenoid pull is directly proportional to $H\ (B - H)$. The solenoid pull, attributable entirely to magnetic leakage in a simple coil and plunger, will be shown to be a very important factor in the behavior of alternating-current electromagnets. By reason of this pull it is impossible to predetermine accurately the pulls at all points by assuming that all of the flux passes through the air-gaps, since all, or nearly all, of the leakage flux cuts the coil.

The general principles of alternating-current electromagnets of the plunger type are illustrated in Fig. 2, wherein there is assumed to be reluctance in the ferric parts and the current is supposed to increase directly with the reluctance of the air-gap plus that referred to above. For the purpose of this article the varying permeability of the ferric parts is not considered but the "D.C. solenoid pull," transferred from Fig. 1 to this figure, is assumed to be of constant form and to vary in magnitude with the strength of the alternating current. Only the curves representing the characteristics

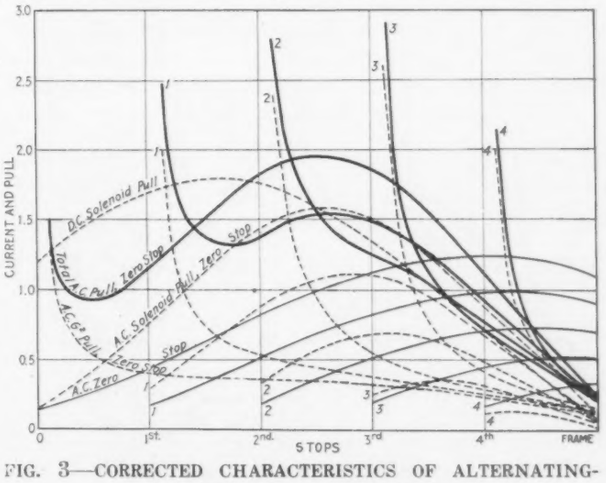


FIG. 3—CORRECTED CHARACTERISTICS OF ALTERNATING-CURRENT ELECTROMAGNET

with zero stop are marked in the figure. The numbers on the other curves indicate that these are the characteristics with stops of corresponding numbers. The coil is assumed to be surrounded with a frame of magnetic material, and the term "zero stop" means that the attraction through the air-gap is between the end of the plunger and the frame, although the cross-section of the air-gap flux path is assumed to be constant throughout the coil.

In all cases, the value of the "D.C. solenoid pull" is multiplied by the effective strength of the alternating current in order to obtain the "A.C. solenoid pull." Then the "A.C. G^2 pull" (proportional to $\frac{I^2}{l^2}$, wherein I is the effective strength of the alternating current and l is the length of the air-gap plus the equivalent additional length of air-gap due to additional reluctance), is the pull in the air-gap proportional to $(B - H)^2$. The total pull is the sum of these two pulls.

Now, when the air-gap is entirely closed, the im-

pedance of the electromagnet will be constant regardless of the position of the joint between the plunger and the stop; but when there is an appreciable reluctance in the air-gap the impedance will be decreased since a portion of the total mmf, proportional to $\int HdL$ (see Fig. 1) is employed in overcoming the reluctance of the air-gap. Consequently the strength of the alternating current will be greater when the air-gap is at or near the middle of the coil than when it is near either end of the coil.

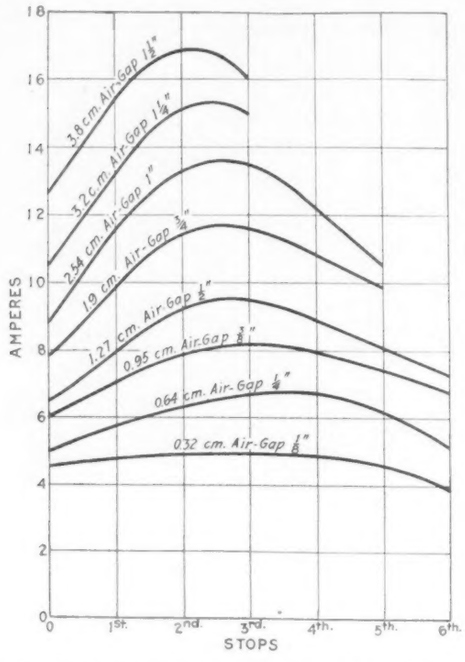


FIG. 4—CURRENT CHARACTERISTICS OF THE TEST ELECTROMAGNET

In Fig. 3 the strength of the alternating current is made to vary with the magnetizing force throughout the entire length of the coil. That is, the current strengths in Fig. 3 are determined by multiplying the current strengths in Fig. 2 by the value of the magnetizing force for corresponding points. The other characteristics in Fig. 3 are developed in the same manner as was employed in producing Fig. 2.

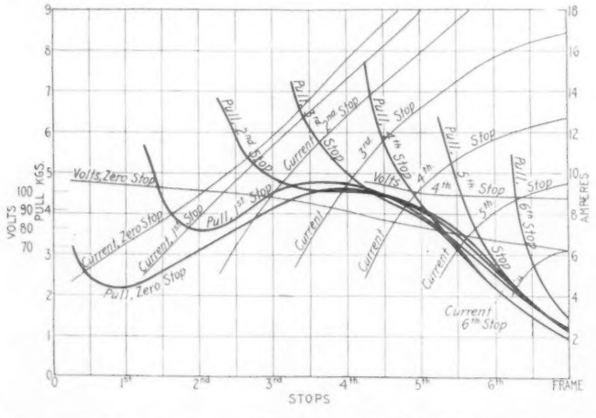


FIG. 5—PULL AND CURRENT CHARACTERISTICS OF THE TEST ELECTROMAGNET

Fig. 4 gives the results of a test of the electromagnet referred to at the beginning of this article. In order to obtain test characteristics at various points throughout the inner limits of the coil and frame, two plungers, 1 sq. in. in cross-section, were employed. One of these was the same plunger used in the test published in the issue of the *Electrical World* dated Jan. 31, 1914.

Fig. 6 shows the general characteristics excepting the pulls and I^2r losses. The watts were read from a wattmeter connected in the usual manner. The numbers on the curves represent the stops, which varied in lengths of ½ in. The resistance of the coil varied from 0.74 ohm to 0.85 ohm during the tests, and, since the tests extended over a considerable period, the results are approximate, although the percentage of variation must be small since the average coil resistance, used in calculating the losses, was taken as 0.80 ohm.

The heating of the electromagnet caused a considerable variation in the pull, so the pull characteristics were taken on a separate test with sufficient intervals between tests to keep the resistance near the average, the idea being to obtain the true pull characteristics for comparison with those in Fig. 3. There was a considerable voltage drop in the line, and this should always be allowed for in designs. It will be found that the current strengths in Figs. 4 and 5 compare favorably excepting for the zero and first stops. There was a great change in impressed emf in both cases, so it is apparent that if the impressed emf had been of constant value the general characteristics for the total pulls in Fig. 5 would closely resemble those in Fig. 3.

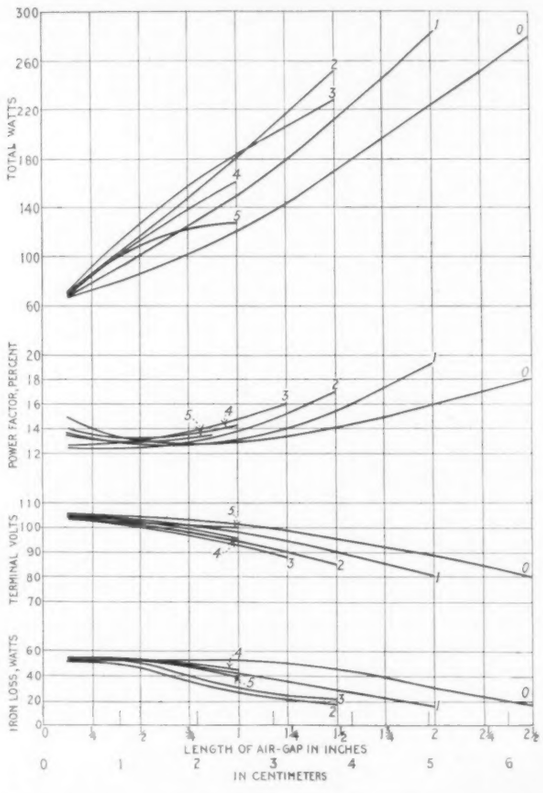


FIG. 6—GENERAL CHARACTERISTICS OF THE TEST ELECTROMAGNET

Referring to Fig. 6 it is seen that for 0.5-in. air-gaps the average power-factor is 13 per cent, the average emf 102 volts, the average total watts about 110, and the average iron loss can be taken as 50 watts. The average current strength for 0.5-in. air-gap (see Fig. 4) is about 8 amp. Then the I^2r loss is $8^2 \times 0.8 = 51.2$ watts, and the total loss is $50 + 51.2 = 101.2$ watts. For a total loss of 110 watts, on the above basis, the current would be 8.6 amp, which probably represents a closer average.

World's Largest Electric Generating Set

Two turbo-alternators, one of which is the greatest ever built, to be installed by the Philadelphia Electric Company —Unique surface-type condensers also unsurpassed in size

IN the new generating station which the Philadelphia Electric Company has under construction adjoining its present Christian Street station there will be installed not only the largest prime-mover electric generating set ever built, but also the largest surface-type condensers ever constructed. These condensers, moreover, embody a unique center-flow principle of design which makes them of particular interest in addition to their great area of tube surface—50,000 sq. ft.

Two turbo-alternators will make up the entire equipment of the new plant—one a 35,000-kw, 13,200-volt, sixty-cycle, three-phase unit, and the other a 30,000-kw, 13,200-volt, twenty-five-cycle, three-phase set. The first-mentioned huge machine, now under construction, is at the present time the largest electric generating unit ever built. It is of the General Electric horizontal type and will measure over all 63 ft. 2 in. in length, 21 ft. 7 in. in width and 15 ft. 10 in. in height. Complete with generator and exciter, it will weigh 600 tons.

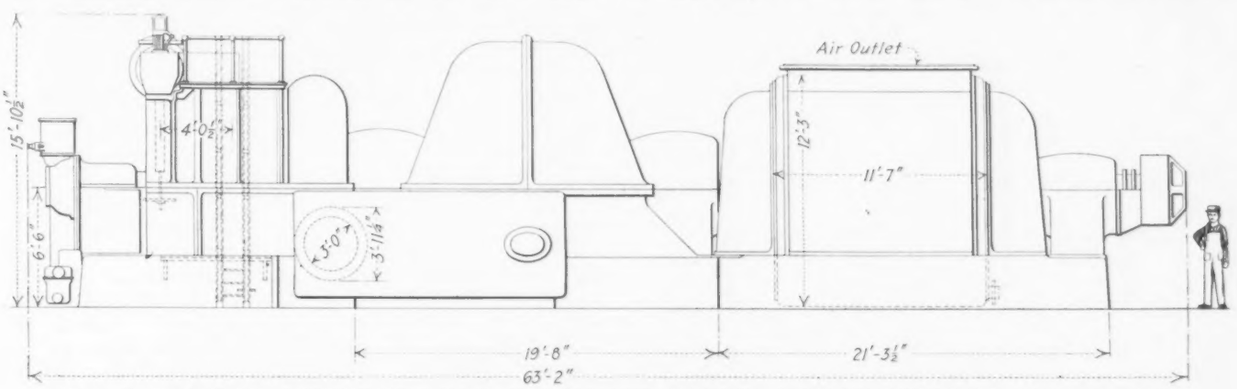


FIG. 1—35,000-KW HORIZONTAL TURBO SET FOR PHILADELPHIA ELECTRIC COMPANY'S NEW STATION

Steam will be furnished its thirteen-stage Curtis turbine element at 215 lb. pressure and 150 deg. Fahr. superheat, and it will exhaust into a 50,000-sq. ft. surface condenser of the center-flow type illustrated in the accompanying diagram. The exhaust enters the condenser shell at the top and passes roughly radially through the banks of tubes to the center, from which point the air is removed. This radial path of the steam, it will be noted, involves the shortest travel through the tubes. The condenser will be the two-pass type with a counter-flow arrangement by which the condensate collects and trickles down over the hottest tubes so that it is removed within a few degrees of exhaust-steam temperature. The annular or outer group of tubes forms the first pass and the central group the second pass.

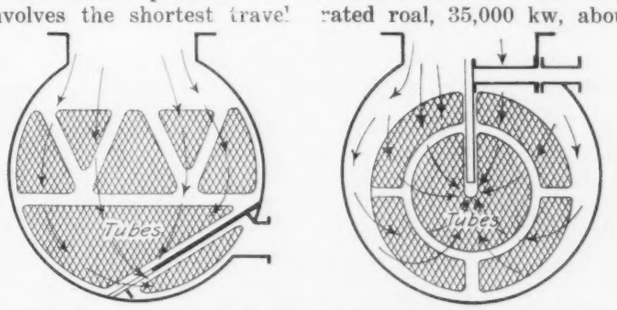


FIG. 2—ARRANGEMENT OF TURBO IN STANDARD AND IMPROVED TYPES OF SURFACE CONDENSERS

The generator element is rated at 13,200 volts, sixty cycles and 35,000 kw and will have a current output of 1460 amp per phase at full load and 90 per cent power-factor. The armature has been designed with an internal reactance amounting to 10 per cent. The six-pole rotating field member is driven at 1200 r.p.m., and carried on the same shaft will be a 150-kw, 250-volt, 600-amp shunt-wound exciter, the stationary parts of which will be supported on a bracket from the outboard generator bearing. To detect and warn of excessive temperatures in the machine, the armature is being provided with thermocouple electric thermometers which will be connected to indicating instruments under the eye of the attendant.

The other big turbine-generator for the Philadelphia company is a 30,000-kw, 13,200-volt, twenty-five-cycle set, operating at 1500 r.p.m. Its armature has been designed with an internal reactance of 8 per cent, but in addition 4 per cent reactance will be added by external coils. This machine, itself one of the largest generating units in existence, will be similarly provided with its own direct-connected bracketed-type exciter. In addition, the new plant will have an auxiliary 500-kw turbine-driven exciter set.

Exhausting against a "vacuum" of 1.5 in. of mercury columns, absolute pressure, it is expected that the 35,000-kw set will deliver 1 kw-hr. for each 11.9 lb. of steam consumed, at loads in the vicinity of 25,000 kw, which is its most efficient point of operation. At full rated roal, 35,000 kw, about 12.6 lb. of steam will be required per hw-hour.

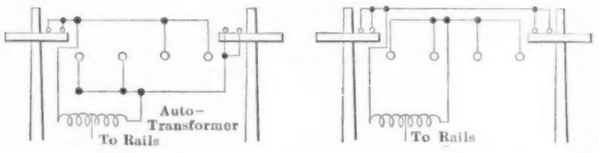
The work of erecting these huge units in the new Christian Street plant at Philadelphia is expected to be begun about September of this year. The General Electric Company is building the turbo-generators. The condensers are being made by the Southwark Foundry & Machine Company, Philadelphia, from designs by the Westinghouse Machine Company, which will also furnish the circulating, air and hot-well pumps.

Minimizing Induction from Single-Phase Railway

Auto-transformer plan for reducing inductive interference in telegraph and telephone lines of the New York, New Haven & Hartford Railroad

MUCH interest has been manifested in the methods employed to overcome the detrimental effect of the single-phase lines of the New York, New Haven & Hartford Railroad upon neighboring telegraph and telephone circuits. As a result of experiments conducted continuously since the installation of the single-phase system, there have been evolved plans which are now giving excellent satisfaction in practical operation.

On account of the presence of the lead sheath of the



FIGS. 1 AND 2—THE BALANCED AND SEMI-BALANCED PLAN

underground cables and the overhead steel structures there is practically no trouble from electrostatic induction along the route of the New Haven road. The chief cause of interference has been magnetic induction attributable to the magnetomotive force of the loop formed by the separated outgoing and return current circuits.

Curative Methods

To overcome the troubles encountered use has been made of two general plans that can best be designated as the curative and the preventive. According to the curative plan, the affected circuits are equipped with transformers which introduce compensating emfs proportional to the disturbances. The transformers have primary windings connected in one or more single-phase lines and secondary windings connected in series with the affected lines, the ratio of transformation being so selected as to produce neutralization. This plan is employed by the American Telephone & Telegraph Company on its New York-Boston underground-conduit lines paralleling the New Haven road at a distance of about 2000 ft.

Preventive Methods

As an outcome of numerous conferences held by representatives of the many interests involved an auto-transformer method of preventing inductive disturbance and simultaneously improving the energy transmission efficiency was adopted. This plan was placed in service on Jan. 25, 1914. Consideration was given by a committee consisting of Mr. W. S. Murray and Prof. C. F. Scott for the railroad, Mr. H. S. Warren for the telephone and Mr. G. M. Yorke for the telegraph interests to three preventive plans, which can conveniently be designated as the balanced, the semi-balanced and the island plan. The general principles of these are as follows:

The balanced plan comprises a three-wire transmission with auto-transformers distributed along the line. These transformers were to be connected across two pairs of feeder wires with 22,000 volts between the two pairs. The mid-points of the transformer windings were to be connected to the track. The feeders were placed two on each side of the track and for convenience may be referred to as the north and south feeders respectively. The generator voltage of 11,000 was to be raised to 22,000 for the line by means of auto-transformers, with their mid-points grounded, installed in the power station.

For the purpose of producing electromagnetic and electrostatic neutralization the north feeder wires were to feed the south trolley wires and vice versa, as shown in Fig. 1. This plan was ideal from the standpoint of transmission economy and of non-interference with foreign lines, but it was felt to be impracticable on account of the difference of potential between the trolley wires, which obviously would be 22,000 volts. This feature would have made the overhead construction difficult, particularly at track switches.

The second plan considered, the one finally adopted, may be called the semi-balanced system. According to this plan all trolley wires are at the same potential, 11,000 volts above the rails. The transmission system and auto-transformer arrangement are as in the first plan except that the trolley wires are connected together and to one terminal of the transformers, while the feeders, in parallel, are connected to the other, as explained further on. Fig. 2 shows by way of contrast with Fig. 1 the general features of the auto-transformer plan.

The third plan considered was one in which the line was divided into a number of sections, insulated from each other, each fed from one or two transformers. By this means the current drawn by a train in any one section could be confined to that section, and the inductive disturbance would be largely balanced out. This plan was not adopted because, in the opinion of the railroad company's engineers, the large expense involved for first cost and annual charges was not warranted by the result to be secured.

Fig. 3 is a simplified diagram of the new arrangement. This is evidently similar to the Edison three-

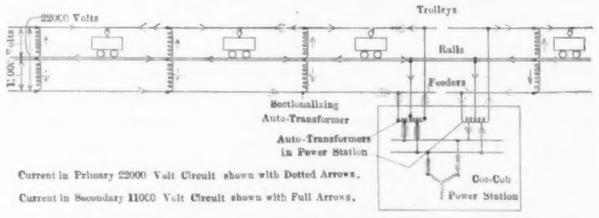


FIG. 3—CIRCUIT DIAGRAM OF PRESENT ARRANGEMENT

wire system except that the direct load is on one side of the circuit, the other receiving its share through the auto-transformers which perform the same function as balancer sets in a direct-current distribution system.

The diagram Fig. 4 shows the Cos Cob power station, which contains 11,000-volt, three-phase generators, used single-phase for the railroad electrification but three-phase for the other energy transmission. By means of auto-transformers installed at the power house the

voltage is raised to 22,000, and the middle points of the transformers are connected to the rails. Line auto-transformers are arranged along the track and similarly connected for the purpose of reducing the electromotive force to 11,000 volts for the trains. The total number of the sectionalizing bridges at which the transformers are situated is twenty-five, of which seventeen are west of Stamford.

By the above arrangement approximation is made to ideal conditions for eliminating inductive interference. While data are not yet available to show the exact extent of the neutralization, a very large part of the interference has been eliminated. The reduction of interference is not quite so great as it would be with a completely sectionalized line on account of the general tendency for some current to flow back to the generating station through the track. That is to say, the magnetomotive forces produced do not quite balance out.

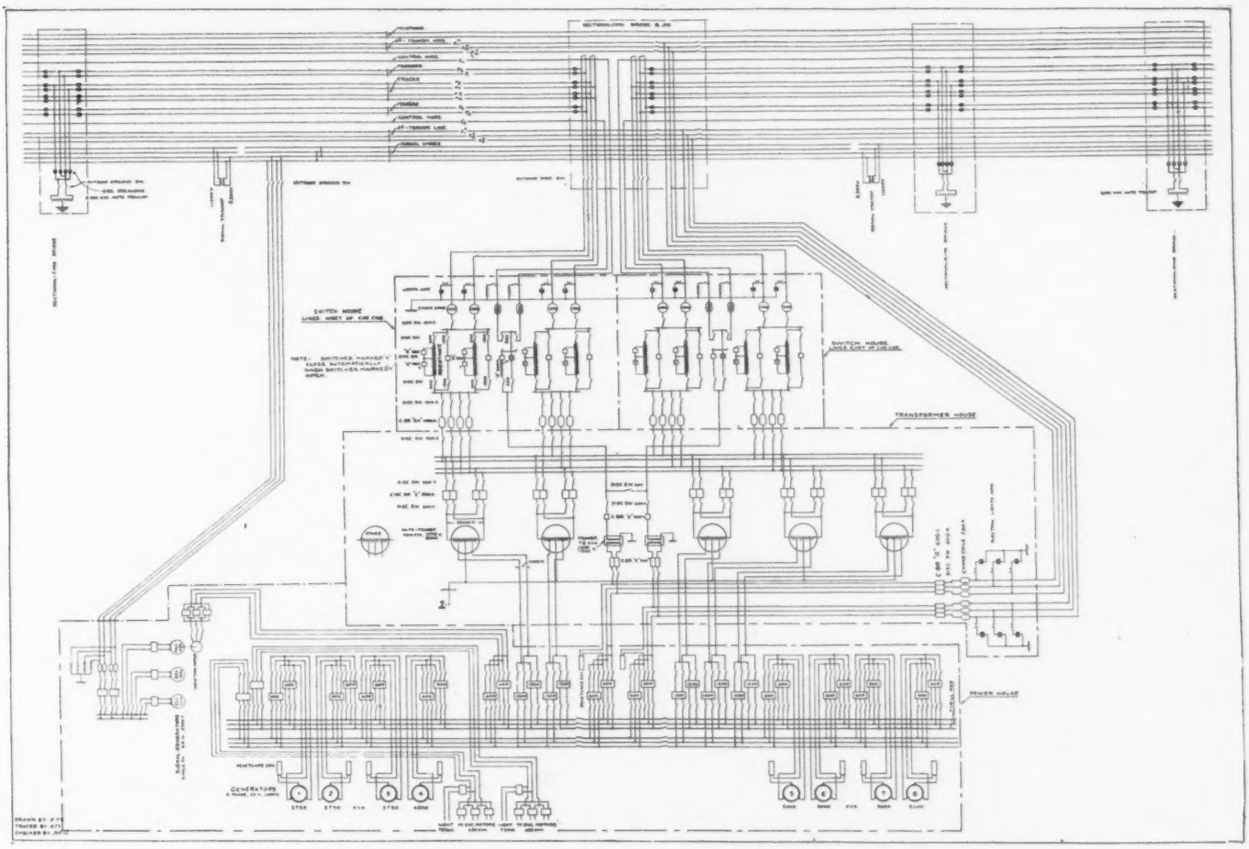


FIG. 4—WIRING DIAGRAM OF COS COB STATION—PRESENT ARRANGEMENT

This is due to the impedance of the transformers. The effect is similar to the flow of current in the neutral of a three-wire direct-current system. The magnetic effect could in some cases be reduced by disconnecting the track return at the power station, but this would introduce a hazard to the line transformers if a break should occur in one of the line wires. It would be possible in this case that the nearest line transformer would become a raising transformer for the line beyond the break and might be thus heavily overloaded.

The general return of current toward the generating plant is actually not very great, and the disturbance in adjacent lines has been largely removed. The telephone company has been able to cut down the number of curative transformers to a larger extent, thus improving the efficiency of speech transmission.

The improvements on the lines west of Stamford have cost about $750,000. This includes the main line from Stamford to Woodlawn, the New York, Westchester & Boston Railway and the Harlem River Division, comprising altogether 222 miles of single track, exclusive of yards. This cost was higher than it would otherwise have been owing to the necessity for making all changes without interfering with operation, one sectionalizing bridge being changed at a time. On the line east of Stamford, the electrification of which will be completed within a few weeks, a different condition exists. There the auto-transformer system and the 22,000-volt transmission system are being installed on a new line. The result is that the cost is greatly reduced, being roughly for the entire overhead system, including bridges, feeders, catenary and transformers, $40,000 per mile of route or $10,000 per mile of track. This is only about 60 per cent of the cost of the overhead system west of Stamford without the auto-transformer system.

It should be mentioned in this connection that a great improvement in energy transmission efficiency has been obtained in operating at 22,000 rather than 11,000 volts.

Experiments on the New Canaan Branch

Some very interesting and useful experiments are now being made on the New Canaan branch of the New Haven railroad in order to secure a scientific basis for the elimination of inductive disturbances. These tests are being co-operated in by the New Haven railroad, the Westinghouse Electric & Manufacturing Company, the American Telephone & Telegraph Company, the Western Union Telegraph Company, the Southern New England Telephone Company and other interests.

The tests were begun on account of a series of disturbances which occurred in the New Canaan office of the Southern New England Telephone & Telegraph Company. The program of the tests was laid out with

a view not only to correcting the local difficulties but also to yield data of reference value in the solution of larger problems. The New Canaan branch is well adapted to these tests as it is off the main line and is not supplied with the auto-transformers like the main line. In fact, it is not suited for this method of compensation, being a stub-end line.

The plans under test consist of two parts and involve a track and line compensator plan, somewhat similar in principle to the scheme already described for the telegraph line. A series of compensating transformers about one to the mile are distributed along the line, which is between 6 and 7 miles long. These tie together either the trolley wire and the track or the trolley wire and the feeder. The transformers have a one-to-one ratio. The general idea can be seen by inspection of Fig. 5. The currents in the primaries and secondaries of the transformers must be substantially equal, hence at the points where the transformers are applied the

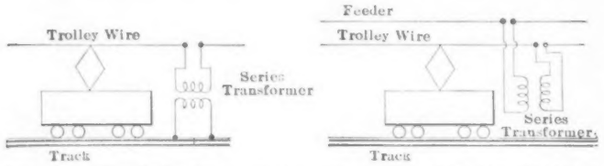


FIG. 5—EXPERIMENTAL PLAN ON NEW CANAAN BRANCH

currents are confined to the circuit in which the transformers are connected. The transformers obviously neutralize return drop.

The tests are being made with and without the transformers and under all conditions of weather and other variables. To make conditions perfectly definite a current of 200 amp is sent through the line for night tests, and during the day measurements are taken under regular operating conditions. The measurements are made on lines in the vicinity of the track and at different distances therefrom. In these lines measurements of voltage, current and phase positions are made.

The New Canaan tests are probably the most elaborate which have yet been made, and the results will be awaited with great interest.

Heating a Large Office with Electric Lamps

At the Electrical Testing Laboratories, Eightieth Street and East End Avenue, New York City, advantage is taken of the heat generated in the lamp-testing racks to deliver pure, electrically tempered fresh air to the general offices, supplementing in this novel way the regular method of heating these rooms by steam. In the life-rack rooms of the Laboratories some 5000 lamps, totaling about 200 kw, are kept burning continuously night and day under carefully controlled voltage conditions. In summer the heat thus generated escapes through ventilators in the roof. At the beginning of the winter season, however, a motor-driven fan is installed to exhaust the heated air from the life-rack room and to deliver it to the offices.

Special Receptacles for Exposition Lighting

The electrical department of the Panama-Pacific International Exposition, to be held at San Francisco in 1915, has developed a new form of lamp receptacle for use in gala and festive lighting. These receptacles are in the form of mission bells and more than 25,000 will be used in a decorative way.

American Electrochemical Society Papers

In addition to the abstracts printed last week of papers read before the meeting of the American Electrochemical Society in New York City on April 16 to 18, the *Electrical World* publishes below a number of others.

Energy Transmission Economics

Mr. P. W. Sothman presented a paper containing data relating to the cost of installing and operating various electrical energy generating and transmitting systems. The author stated that the initial cost of installing generating plants of various types is approximately as follows in dollars per horse-power: Hydroelectric, $125; steam, $100; gas-producer, $100; oil engine, $100.

On the bases of a load-factor of 60 per cent and fixed charges of 11 per cent on hydroelectric and steam stations and 12 per cent on gas and oil plants the cost of energy in mills per kilowatt-hour would be as follows: Hydroelectric, 3.6; steam, 6.25; gas, 4.95; oil, 5.62.

The accompanying table shows data relating to the cost per mile of transmission lines based on the use of No. 000 B. & S. gage copper cables with copper at 18

COST OF TRANSMISSION LINES

Description	Towers or Poles, Including Footings	Cables and Erection	Insulators	Total
12,000 volts, wooden-pole line:				
Double-circuit	$1400.00	$3120.00	$130.00	$5115.00
Single-circuit	1100.00	1600.00	65.00	3042.00
30,000 volts, wooden-pole line:				
Single-circuit	1400.00	1650.00	200.00	3575.00
60,000 volts, steel towers:			Pin type	
Double-circuit	1800.00	3300.00	220.00	5852.00
Single-circuit	1630.00	1700.00	110.00	3784.00
110,000 volts, steel towers:			Suspension type	
Double-circuit	2050.00	3300.00	622.00	6569.00
Single-circuit	1850.00	1720.00	350.00	4312.00

cents per lb. It is assumed that the wood poles are spaced 120 ft. apart and the steel towers 550 ft.

The market price for aluminum cables is generally lower than that for copper cables of equal conductivity, but this advantage is offset by the necessity for using slightly higher towers with aluminum because of the greater sag at the middle of the spans.

With proper care in the design and selection of materials, especially insulators, coupled with the use of suitable protective apparatus, a modern line should give practically uninterrupted service.

Electric Zinc Smelting

The paper by Mr. W. R. Ingalls brought out the fact that electric zinc smelting is still in its infancy and that there are very few data available at present on the cost of production by that method. While some claim that zinc smelting can be done in one operation by the electric method, the author declares that it will require two separate treatments just as with the fire-smelting method, otherwise the furnace will yield blue powder. Electric smelting has the advantage of being continuous, however, instead of being intermittent, as with the fire process.

In smelting 1000 kg (2200 lb.) of zinc ore containing about 25 per cent to 50 per cent zinc, it is estimated that from 900 to 1050 ton-calories (3571 to 4166 ton-Fahr. units) of heat are required, which is equivalent to 1047 kw-hr. and 1221 kw-hr. of electrical energy respectively. At the prevailing rates for electricity it is, therefore,

advisable to use coal for heating where possible and employ electricity only when it is especially needed If the operating data on electric zinc smelting in Norway and Sweden were adjusted to American conditions, the author declares, the cost of the electric process would make it prohibitive.

Metal Inventory in an Electrolytic Copper Refinery

A simple and inexpensive method of inventorying the metal used in an electrolytic copper refinery from the time it enters the plant until the finished product is shipped was described in the paper by Mr. Ralph W. Deacon. To facilitate obtaining the efficiency of different processes in the plant the system is subdivided under four general heads: Anode department, tank house, wire-bar department, and silver refinery. The method of accounting is particularly adapted to plants employing the Walker arrangement of the multiple system of refining.

A Microscopic Study of Electrolytic Iron

The paper by Mr. Oliver W. Storey contained forty-eight miscroscopic views of electrolytic iron prepared under different conditions. From a study of the microstructure of this type of iron the author draws the following conclusions: No change in the structure of electrolytic iron can be determined at temperatures below the A_3 range; a fine deposit is more readily changed to grain structure than a coarse deposit; by heating for a short time above the A_3 range a fine deposit is transformed into a fine-grain structure while a coarse deposit becomes coarse-grained, but the latter may be broken down into smaller grains by annealing at the A_3 point or by heating to 1000 deg. or higher, and the grains of electrolytic iron do not grow appreciably at 1150 deg.

Electrodeposition of Cadmium

The suitability of different salts of cadmium to the electrodeposition of the base metal was discussed in the paper by Messrs. Frank C. Mathers and Hugh M. Marble. Fluoride, fluosilicate, fluoborate or perchlorate solutions containing 4 per cent cadmium, with 0.5-5 per cent free acid and 0.2 gm peptone, glue or phloridzin, or four drops of clove oil, gave excellent, smooth deposits. A bath containing 4 per cent cadmium chloride, 10 per cent ammonium chloride, 5 per cent hydrochloric acid (by volume), 0.1 per cent peptone and 10 per cent ferric chloride gave smooth, finely crystalline deposits.

These experiments demonstrated the value of an additive agent, since smooth deposits of cadmium could not be obtained without their use. Clove oil, peptone, glue and phloridzin, which are the same addition substances employed in lead plating, are also valuable in cadmium deposition.

Electrodeposition of Nickel

The paper by Messrs. C. W. Bennett, H. C. Kenny and R. P. Dugliss called attention to the results of early experimenters, showing that stirring the electrolyte of a nickel-plating bath does not affect the efficiency of the deposition, while rotating the cathode lowers it. In each case the iron deposit is increased, unless the cathode is placed in a porous cup containing an ammoniacal solution. Curves were shown indicating the effects on the efficiency of rotating the cathodes, employing a porous cup and increasing the concentration of the ammoniacal solution in the porous cup.

The following conclusions were arrived at: A good deposit of nickel can be obtained from the double sulphate if the solution at the surface of the cathode is kept alkaline. Since the rate of deposition is dependent upon the degree of alkalinity of the cathode films an initially high efficiency can be obtained and maintained by adding a definite amount of ammonium hydroxide to the solution to begin with. The alkaline film can be disturbed and the efficiency of the deposition thereby decreased by stirring the solution vigorously; the iron deposited on a rotating cathode is greater than that formed on a stationary electrode, but the iron content of the anode does not materially affect the efficiency of deposition.

Notes on Some Electrical Properties of Silver Sulphide

Laboratory experiments were described in the paper by Mr. F. A. J. FitzGerald showing that silver sulphide has certain electrical characteristics which make it unsuitable for thermoscopic purposes when employing direct current but quite practicable when carrying alternating current. When unidirectional current flows through silver sulphide its resistance gradually decreases owing to electrolysis forming metallic silver. If placed in an alternating-current circuit, however, silver sulphide will maintain a constant resistance for quite a long period unless heat is applied, when the resistance will drop considerably, depending on the temperature change. The drop in resistance of silver sulphide when subjected to alternating current is attributed to electrolysis caused by the rectifying action of this chemical compound.

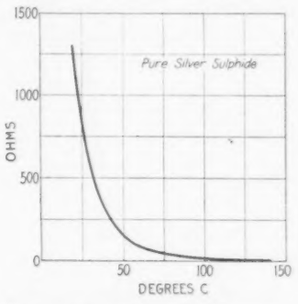


FIG. 1—SILVER-SULPHIDE DISK BETWEEN SILVER DISKS IN OIL BATH

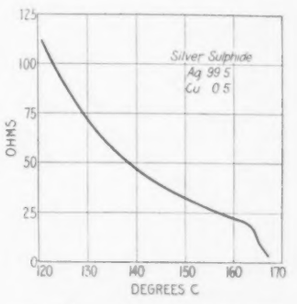


FIG. 2—MACHINED SILVER-SULPHIDE ROD WITH SILVER CAPS

The paper pointed out that the greater the percentage of copper present in the silver sulphide the lower is the critical temperature (that is, the temperature at which the resistance takes a sudden drop). With 0.5 per cent copper present the critical temperature is about 162 deg. C., whereas with 7.5 per cent copper the critical temperature is lowered to 104 deg. C.

The Effect of Addition Substances in Lead-Plating Baths

The paper prepared jointly by Messrs. Frank C. Mathers and O. Ralph Overman pointed out the best substances to incorporate in a lead-plating or refining bath to increase the density, brightness and non-crystalline appearance of the deposited metal. The addition substances recommended in order of their beneficial effects are as follows: Clove oil or eugenol, peptone, phloridzin and gum guaiac. Clove oil is especially recommended for use in lead-perchlorate plating and refining baths, about 0.3 lb. being required per ton of lead.

Addition Agents in the Deposition of Zinc

The paper prepared jointly by Messrs. O. P. Watts and A. C. Shape presented the effects of adding about forty different organic substances to a zinc-plating solution with the hope of improving the character of the metallic deposit. The most satisfactory addition agents found by these experiments were eikonogen, pyrogallol and betanaphtol, the latter being the best. The majority of the substances had injurious rather than beneficial effects. The most common defect in the deposits was the presence of vertical grooves or striations.

Central Station Management

Devoted to Discussion of Administrative Policies, Commercial Methods, and Current Practice Among Successful Utilities

An "Electric Cottage" at Lexington, Ky.

To demonstrate the multitude of uses which can be made of electricity in the home the Lexington (Ky.) Utilities Company has just opened on a prominent and easily accessible corner what it terms the "Electric Cottage." Large advertisements in the Lexington papers and circulars which went out by mail invited the people of the city to make the cottage a down-town convenience and meeting place. The house contains several rooms and is furnished with a complete electrical kitchen, while the other rooms of the house have other electrical conveniences. Demonstrations are in charge of girl graduates of the local Harrison school of applied electricity, assisted by the junior class of the domestic science department of the Kentucky State University, which is in Lexington. Every day at fixed hours cooking is done and the finished products are served to those who come to see. One feature of the exhibition which is attracting much favorable attention is the electric burglar alarm displayed in the bedroom.

A Sign a Day for a Year at Toledo

"Our new slogan sign is a wonder! It is a business getter without an equal!" These and similar sentiments expressed by Mr. F. R. Coates in the recent new-business convention, at Toledo, Ohio, show what the officials

FIG. 1—ONE OF THE SIGNS PHOTOGRAPHED FOR "ADS"

of the Toledo Railways & Light Company think of the slogan-sign idea. The new-business department of the company, not to be outdone, has itself adopted a slogan, namely, "A sign a day for a year," and from present indications it will be able to exceed even the letter of the phrase. During the first four months of the campaign more than two hundred signs were sold and the business has now reached a stage where sign companies are shipping completed signs to Toledo in carload lots. Business is being solicited from all classes of customers, and it is

FIG. 2—A TYPICAL WINDOW-LIGHTING INSTALLATION

hoped that six or eight national advertisers will be induced to erect signs within the next month. All signs are connected on a special sign circuit and are turned on and off by a patrolman.

Energy for sign lighting is sold on a flat rate, 9 cents a lamp a month, this price including lamps, renewals and all other necessary maintenance. The most effective talking point used in connection with this rate is the hourly cost of operation of the sign which the prospective customer appears to favor. This figure is usually considerably less than a dollar for an average-sized sign, and such an advertising rate appeals to the merchant as low in comparison with other advertising mediums. A census of signs thus far erected shows that the average sign contains about 250 10-watt tungsten lamps.

Much of the success of the campaign is attributed to the fact that as soon as a sign is in operation a photograph of it is taken and published in the daily papers, advertising both the electric service and the place of business of the newly acquired sign customer. Distinctive signs are sold in all cases, the company operating on the theory that one original clever design helps to sell other signs to the competitors of the first purchaser. The thoroughness of the methods being employed by the company may be realized when it is stated that two circular letters a week, street-car posters and newspapers are used for advertising, while two sign companies retain salesmen and designers in the central-station company's office to assist the solicitors.

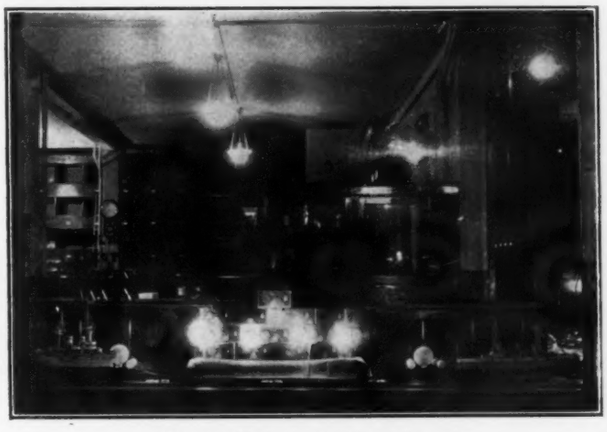
Taking things in logical order, a window-lighting campaign was inaugurated two months before the sign campaign started, the two campaigns continuing together. By beginning the window-lighting campaign first, customers were induced to put in better lighting, although they might not have done so had the sign proposition been broached first. The campaigns are being conducted under the direction of Mr. A. K. Young, new-business manager for the Toledo company, and it is his belief that the mark of "a sign a day for a year" will be exceeded by a goodly number.

Combination Ice-Electric Operation in an Ohio Town

The combination ice-electric plant in an Ohio town of 3500 has an ice-making equipment with a maximum capacity of 10 tons of ice per day. The steam-driven compressor equipment and auxiliary ice-plant apparatus represents an investment of $8,550, added to which is the investment in the building addition amounting to $500, thus making the total added investment required for ice-making $9,050. Year before last this plant made 1057 tons of ice, the gross income from its ice business being $2,677. The preceding season was even better, for that year the plant turned out 1511 tons of ice, bringing in a gross return of $4,215. The ice plant ordinarily operates four months of the year, and distilled water is used for ice making.

A Timely Window Display

Catching a bit of the wartime spirit, the Philadelphia Electric Company has been exhibiting a lamp window display which has attracted much interested attention from the passing public. A "fort" was built of lamp cartons and from its dozen ports, like so many guns, projected 40-watt frosted tubular tungsten maps. Each unit was fitted with a thermostat flasher pocket which caused the lamp to flash briefly at irregular intervals simulating the firing of the gun. "In the offing" at the sides of the window floated two miniature battleships, while from its staff on the topmost parapet of the fortification a small silk American flag fluttered gallantly in the breeze of an 8-in. fan concealed behind the fortress structure. The display caught the eyes of thousands of citizens fresh from a perusal of "scarehead" dispatches from Washington and Vera Cruz, and proved an effective advertisement.



A "WAR-TIME" WINDOW DISPLAY

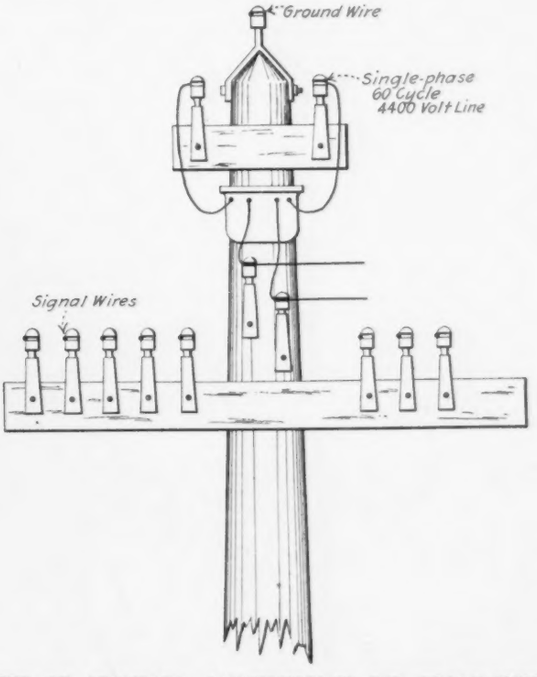
Four Hundred and Sixty-five Miles of Block-Signal System Operating from Central-Station Energy

Eliminating the former standard battery cell and purchasing energy from nine electric-service companies, the Chicago, Milwaukee & St. Paul Railroad Company is now operating 250 miles of its automatic electric block-signal system from central-station energy and has an additional 215 miles of this work under construction. The railroad company's signal practice for this type of work is standard, energy in all cases being received at 2300 volts and conducted through transformers raising the potential to 4400 volts. With two exceptions, these step-up transformers, which range in rating from 12 kw to 40 kw according to the number of block signals served, are situated in the stations of the electric-service company and are controlled from a panel in that plant. Separate pole lines have been built for the 4400-volt circuit and the signal wires which serve the block system.

The type of construction employed, as shown below, consists of a ground wire mounted on a bracket at the top of the pole, a two-pin cross-arm for the single-phase, 4400-volt, sixty-cycle line, and a standard ten-pin arm 2 ft. beneath for the single wires. At points where a 1-kva transformer is installed to serve a block signal, the standard ten-pin arm is lowered to give a 4-ft. clearance to the signal wires.

Wire on the 4400-volt line is No. 4 copper B. & S., while that on the second arm is No. 10 insulated. In some places it has been necessary to carry the transmission circuit and signal wires on the same pole line with telegraph circuits, but even in these instances no trouble has been experienced due to induction.

Mr. J. C. Mill, signal engineer for the Chicago, Milwaukee & St. Paul Railroad, says that for ease of operation central-station energy for block-signal systems certainly commends itself. On the divisions without batteries the operating force has been reduced to one-half its former size, a maintenance man covering one section of track which formerly required the services of a maintenance man and a battery man.



TYPES OF STANDARD CONSTRUCTION FOR BLOCK-SIGNAL SYSTEM

On the Chicago-Omaha branch of the road this system has been installed between the cities of Forreston and Savanna, energy being supplied by the People's Gas & Electric Company, of Savanna, and by the Illinois Northern Utilities Company, of Forreston and Hampshire. On the Chicago-Milwaukee division of the road energy is supplied by the Milwaukee Electric Railway & Light Company. Between Milwaukee and La Crosse, Wis., energy is supplied by the Watertown Gas & Electric Company, the Portage Electric Light & Power Company and the O. I. Newton Sons Company, Sparta, Wis. On the river division between La Crosse

and Hastings, Minn., energy is supplied by the Winona Railway & Light Company, the Red Wing Gas Light & Power Company and the Minneapolis General Electric Company.

Central-Station Electro-Therapeutic Bureau

The New York Edison Company has the credit of establishing and maintaining the only central-station electro-therapeutic department in the world. This bureau was organized last May because of the multitude of requests from the medical profession for information regarding the characteristics and reliability of different types of electro-therapeutic apparatus. At that time it seemed impossible for physicians and surgeons to obtain impartial opinions regarding the relative advantages of these devices, so the central-station company, living up to the duties which it felt were implied by its general title of public-service corporation, provided quarters with experts in attendance where all types of electro-surgical apparatus could be displayed and where the medical profession could meet and have informal discussions regarding the merits of the devices.

At first it was difficult to interest manufacturers of electro-therapeutic apparatus sufficiently to obtain devices for equipping this new bureau, but after a few had been induced to submit their products the rest of the manufacturers followed with increasingly generous consignments. Now nearly all reliable types of electro-therapeutic instruments are on display and the exhibit is being constantly replenished with apparatus of latest design.

Every month about 10,000 letters are sent out by the department to the physicians of New York State informing them of the existence of the New York Edison Company's electro-therapeutic department, and of any new device which has been brought out, and inviting them to visit the bureau. Other publicity methods, such as sending out electro-therapeutic advertisements in the form of blotters and paperweights, are also employed to acquaint the surgeons with this depart-

FIG. 1—ELECTRO-THERAPEUTIC EQUIPMENT DISPLAYED BY NEW YORK EDISON COMPANY

ment. A portion of the *Edison Bulletin*, published monthly, is also devoted to the subject of electro-therapy. About 6000 doctors in New York City alone are reached through at least one of these means. These men often bring visiting out-of-town members of their profession, and all declare that the department and the information imparted by its expert attendants are of inestimable value to the medical fraternity. Commencing about the middle of February, a register of visiting medical men was established and for a subsequent period of thirty days showed more than 200 callers. The publicity which this department is receiving locally and through outside medical circles is shown by the rate at which the number of callers per day is increasing.

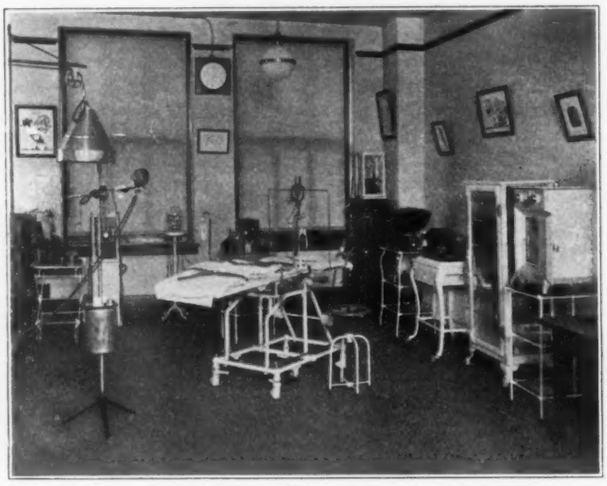


FIG. 2—OPERATING TABLE AND ELECTRIC SURGICAL INSTRUMENTS DISPLAYED BY CENTRAL STATION

The bureau is in charge of two graduate nurses—Misses Winifred Black, manager, and Anne Broome, assistant manager. Part of the time of each is spent at the electro-therapeutic bureau at 124 West Forty-second Street, New York, while a considerable portion is occupied in visiting surgeons and medical institutions in different states to obtain information regarding the uses of electrical apparatus for medical and surgical purposes, the results obtained therewith and the types most suitable for special treatments. The information thus obtained is kept on permanent file at the bureau and is imparted to any of the medical profession desiring information on the subject.

The interest which has been taken in this public-service work is shown by the co-operation received from the New York doctors, who have formed a research committee, with Dr. Edward Titus as chairman, to compile data on the results obtained with different electrical and surgical devices. The committee contemplates conducting experiments to show the relative effects obtained with different X-ray machines.

No apparatus is sold by the Edison company and no financial support is received from the manufacturers through commissions on sales. Only information and demonstrations are given at the bureau. Since being established, however, the electro-therapeutic bureau can trace 250 appliance sales to its efforts, about six of which were for X-ray machines. While in itself the revenue received for energy consumed by these devices offers no incentive for the maintenance of the bureau, yet the company feels that the latter is well warranted by the benefit rendered the medical profession and electrical industries. Moreover, the support of such a department inspires public confidence in the public-service spirit of the company. As an indirect and almost negligible benefit to the central-station company it is declared that the sale of these devices to doctors for residence use has often involved the connection of electric service, which is then also utilized for other purposes, such as lighting, small-motor service, heating, etc.

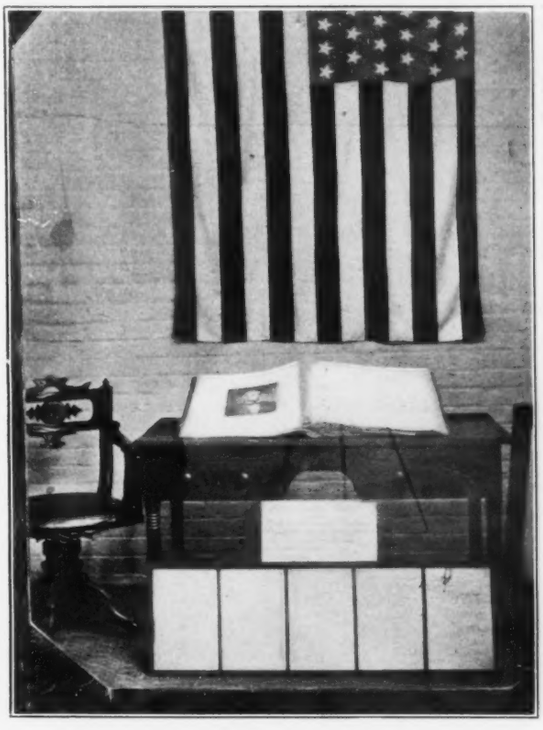
Illumination and Wiring

Inverted Magnetite-Arc Lighting at Akron, Ohio

The principal streets of the business center of Akron, Ohio, are now lighted by 213 inverted-type luminous-arc lamps spaced at about 60-ft. intervals opposite each other on both sides of the street. The first of these lamps were installed about a year ago, and since that time their number has been increased by frequent additions. Outside the district served by these ornamental lighting standards there are 418 magnetite-arc lamps suspended over the streets. The residence section is lighted by 2000 series incandescent tungsten lamps suspended from brackets borne on poles carrying overhead wires.

Lighting a Famous Relic by Electricity

At the Connecticut State Library in Hartford the table on which Abraham Lincoln signed the Emancipation Proclamation occupies a place of honor among the historic treasures of the building, and concealed electric lighting is effectively utilized to display this famous piece of furniture. As shown in the accompanying



HISTORIC TABLE LIGHTED BY ELECTRICITY

photograph, the table stands in a fireproof recess built into the wall, the compartment being about 12 ft. high, 8 ft. wide and 6 ft. deep. Ordinarily illumination is provided by two 40-watt tungsten lamps in the ceiling of the chamber, but when it is desired to increase the lighting of both the table and a photographic reproduction of the proclamation in front of it a row of four 40-watt lamps carried in a reflecting trough about 8 ft. above the floor can be thrown into circuit by a pendent switch situated behind the plate-glass door which protects the priceless relic from handling. None of the lamps is visible from outside the compartment. Service is supplied by the Hartford Electric Light Company.

Two Thousand Nitrogen-Filled Lamps Ordered for Chicago Street Lighting

As a result of tests made by the electrical department of the Sanitary District of Chicago under the supervision of Mr. E. B. Ellicott, electrical engineer of the Sanitary District, the District will use 2000 nitrogen-filled metal-filament incandescent electric lamps for street lighting. These lamps are to be of the 300-watt and 500-watt sizes, the former giving 600 actual cp and the latter between 1100 and 1200 actual cp. The number of each to be ordered has not been determined. The two sizes are ordered for different sections of the city, the smaller lamp being used principally in residential quarters. The new lamps will be operated on straight series-arc alternating-current circuits and will be operated from compensators which give 20 amp in the secondary of the circuit.

A series of tests was made under Mr. Ellicott's direction to see what shocks the nitrogen-filled lamps would stand. With a circuit of 5000 volts, in which enough lamps were used to take up all the voltage except the small proportion required by the regulator, it was possible to short-circuit all of the lamps but two, throwing all the energy on these two lamps with nothing but the regulator to protect them. As a result of nineteen tests not a single lamp filament was broken as the result of this procedure. This test, according to Mr. Ellicott, represents the worst possible conditions that could be met in actual practice. Under these conditions the lamps received at times (depending on the part of the wave in the circuit supplying the lamp at the instant of test) from 25 per cent to 60 per cent excess current for the length of time required for the regulator to adjust itself to the situation. This test shows apparently that the new lamp is a rugged piece of apparatus well suited for its purpose.

Method of Suspension

The nitrogen-filled lamps will be suspended at the same height and in much the same manner as the flame-arc lamps; that is, at about 26 ft. above the street pavement, one lamp being supported by each lamp-post on a bracket. It is understood that the lamp manufacturers have offered a guarantee of 1350 hours of life. This means an average of three lamp renewals a year for these nitrogen-filled lamps. Mr. Ellicott says that there is no question that the lamps will maintain their candle-power within 10 per cent of the initial rating for the whole term of the life of the lamp. Both sizes of lamps take about 30 volts on the series circuits. They have been operated in tests intermingled with flame-arc lamps, and it is practicable, apparently, to operate mixed circuits. However, it is likely in the permanent installation that the nitrogen-filled incandescent lamps will be operated on individual circuits, the number of lamps which will belong to each circuit not exceeding 125.

Mr. Ellicott is decidedly of the opinion that there is a broad field in street lighting for the new nitrogen-filled lamp. He says, however, that in his judgment it will not supersede the flame-arc lamp altogether, as, for instance, in downtown business streets where brilliant lighting with some element of glare is desired by merchants. He points out that in the operation of the new type of lamp proper regulation is an essential. However, regulating apparatus is built which is good enough and quick enough to operate automatically to protect the lamp. The Chicago tests developed the fact that the lamps should be used with compensators, as the latter absorb much of the excess of current and give the regulator a chance to work before it has received the full value of the excess.

Electric Lighting for St. Louis Pageant

Elaborate preparations are under way for the "Pageant and Masque of St. Louis," an outdoor spectacle to be given in the natural amphitheater at the foot of Art Hill, in Forest Park, St. Louis, on May 28-31. Four performances will be given, the pageant beginning at 6 or 6.30 p. m. on each day and lasting an hour and a half. After a half hour's intermission the masque will follow, likewise lasting about an hour and a half. The spectacle is planned on a very large scale, about 7000 persons having parts in the cast. The stage, about 480 ft. wide in the widest part and about 200 ft. deep, will be built on piles over a lagoon. Across 150 ft. of water will be arranged, on the slope of Art Hill, seats for 43,000 spectators. There will be standing room for 30,000 more.

Electric lighting for this spectacle, beginning in waning daylight and ending at night, will be on an unusual scale. Around the concave curve of the lagoon, on the spectators' side, will be 125 shore-line lighting units, each consisting of a 250-watt tungsten lamp and a Benjamin angle reflector. These lamps, which will illuminate the water-borne spectacles, are spaced about 3.5 ft. apart in the center, the distance between lamps being gradually increased to 15 ft. at the ends of the curve. The stage has no roof. At each side of it will be a 40-ft. tower, on which will be mounted spot-lights and flood-lights. The foot-lights will be placed in specially designed reflectors extending along a water-front line of the stage 330 ft. long. These footlight units, consisting of 250-watt lamps, colored red, white and amber, will be spaced 1 ft. 2 in. apart.

For local lighting on the stage eight floor outlets will be provided. One feature of the setting will be "Cahokia Mound." Before this hillock will be an "altar" provided with a 1000-watt nitrogen lamp with parabolic reflector. Two spot-lights (or perhaps 1000-watt tungstens) will be provided well down stage for what is called the "dreaming pageant." In all, eight spot-lights will be provided.

The orchestra and chorus will be invisible to the spectators, being at the back of the stage but concealed by a 10-ft. screen. From the top of this screen wires will lead across to the back-drop and from these wires will be suspended sixty-four 60-watt lamps with opaque reflectors to prevent the light going up. The back-drop, 350 ft. from the nearest spectator, will be 40 ft. high.

Six 18-in. search-lanterns, placed at advantageous points on the stage, will add to the other lighting effects. A special feature will be the Great Bear constellation. Immediately back of the back-drop and rising 75 ft. above the stage on a tower will be a structure not visible in daylight but arranged to show at the proper time after dark a field of small stars, with the constellation of the Great Bear showing in large stars. Electric lamps will be used for this spectacle, and a twinkling effect will be produced.

To illuminate the seats on Art Hill four 24-in. search-lanterns will be mounted on the roof of the art museum. These lamps will be at the back of the spectators and will be provided with diffusing lenses. In all, about 225 kw of electrical energy will be required—200 kw for the stage and the remainder for the art museum search-lanterns. Alternating current will be provided by the Union Electric Light & Power Company. A special transmission line will be built and there will be a substation at the back of the stage, with transformers and with motor-generators to produce the direct current needed for the spot-lights and search-lanterns. The switchboard will be in one of the 40-ft. towers at the front of the stage. Telephonic communication will be maintained between the chief electrician and all spot-light and search-lantern operators. The working switchboard will represent the stage in miniature, the switches being placed at the parts where the lamps controlled by those particular switches are located. A very striking feature of the performance, as planned, is the rise and flight of an aeroplane containing the "Spirit of St. Louis." Beams from search-lanterns will be concentrated on this aeroplane until it disappears in the distance.

Mr. A. I. Jacobs, supervisor of city lighting for the city of St. Louis, is in charge of the electric lighting of the pageant. His assistant, Mr. Ralf Toensfeldt, is laying out the work.

Novel Electrically Illuminated Clock

In the recently completed Hotel Bancroft at Worcester, Mass., a large self-winding electrically illuminated clock set in the floor of the lobby at the main entrance is a striking feature. The clock is designed with a plate-glass face 1 in. thick and 2 ft. in diameter, supported by bronze rings as shown in the accompanying photograph, and the numerals and minute marks are etched by sand-blasting on the under side of the plate, which

ELECTRICALLY ILLUMINATED CLOCK

thus forms the dial. A rubber gasket placed between the plate and the adjacent bronze ring provides for expansion and contraction. The hands are driven by a spring-operated and balance-wheel-controlled train set in a recess in the floor, the recess being formed by a metal box 10½ in. deep, which is painted white. Eight inches below each numeral is a 10-watt tungsten lamp placed horizontally, and the white finish on the interior of the recess is utilized in reflecting the light from the twelve lamps evenly through the dial. The photograph was taken by an exposure of approximately ten minutes to the light of the dial on a recent rainy afternoon. The clock spring is wound by a

small motor operated by three dry cells at intervals of five minutes, and every hour the hands are set correctly by a Western Union telegraph connection. It is estimated that the cells will operate the clock for one year before a new battery will be required. Four ventilating outlets leading to a hollow space between the floor tiles are provided in the containing case to carry off the heat produced by the 10-watt lamps. The clock has been a factor in advertising the hotel and was devised by Mr. L. F. Viner, mechanical superintendent, who has applied for a patent on the design.

Cross-Over Construction Near Denver

The Denver (Col.) City Tramway Company is using a "high factor of safety" construction on one of its newly constructed transmission lines where the latter crosses foreign circuits, rights-of-way, etc. The line operates at 13,200 volts, but 65,000-volt porcelain insulators supported on grounded metal pins are employed.

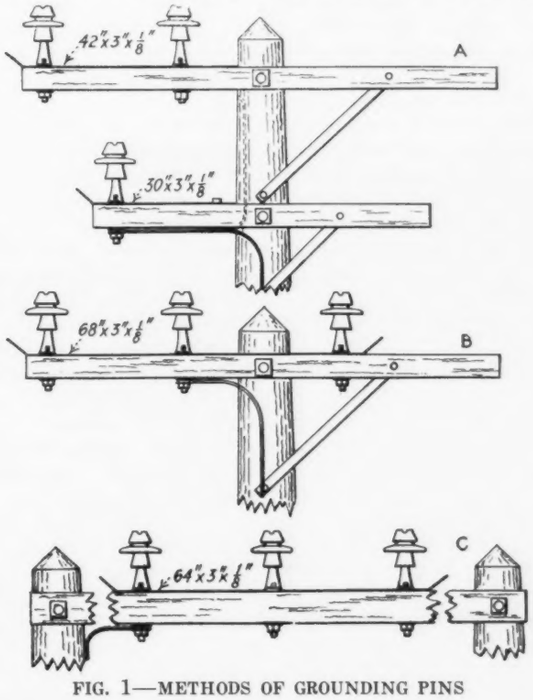


FIG. 1—METHODS OF GROUNDING PINS

Stranded instead of solid conductors are used, and on each side of a foreign cross-over a permanent ground strap is fastened along the top of each cross-arm to ground any conductor which might break and fall on a circuit below or cause other damage.

The accompanying illustrations show the methods of installing the ground straps, ground connections, insulator pins, guys, etc. The ground straps, which are made of iron 0.125 in. thick and 3 in. wide, lie flat on the cross-arms and extend beyond the ends, being bent upward at a slight angle to prevent an outside conductor from falling to the ground. Each insulator is fastened to the arm by a 0.75-in. bolt passing through the arm and ground strap into the metal insulator pin and drawn up firmly from the bottom by nuts, washers and lock nuts as shown. The bolts also connect the pins electrically to the ground strap.

The ground conductor consists of a No. 2 solid copper wire, which is soldered, wiped and tinned at a point about 8 ft. above the earth to a 1-in. galvanized-iron pipe extending an equal distance into the ground.

The first two poles away from each side of a foreign cross-over are cross-guyed and are equipped with double cross-arms and metallic ground straps. The second and third poles are connected by a single diagonal guy wire.

In one of its official bulletins the company states that

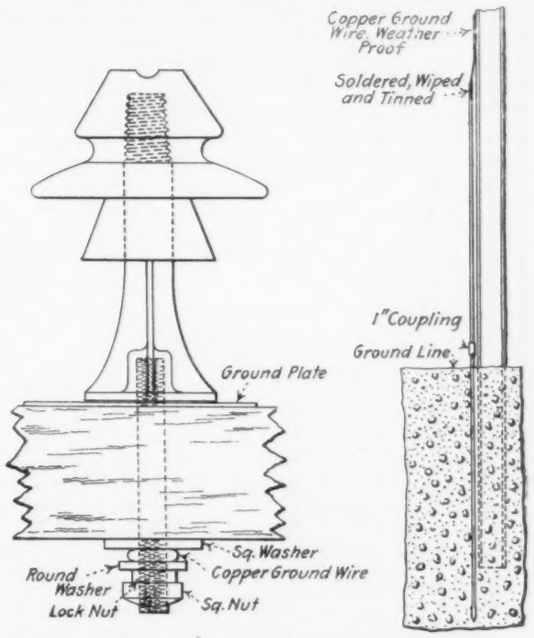


FIG. 2—DETAIL OF METHOD FOR GROUNDING PINS

"the foregoing method of construction at foreign wire crossings was adopted at an increased cost per crossing, not because our present method, of which we have 131 crossings, has given any trouble in the six years it has been in service, but because we wanted the best obtainable and felt that a type of construction that has the backing of the foremost electrical societies must be the last word in foreign-wire crossing. The plant is no more reliable than the weakest link in the chain, which is naturally the line."

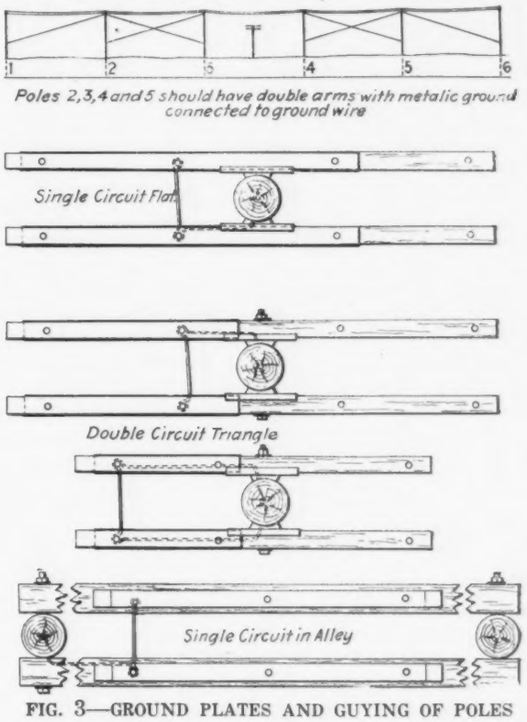


FIG. 3—GROUND PLATES AND GUYING OF POLES

Recent Telephone Patents

A protected cable terminal has been patented by Mr. T. B. Farmer, of Baltimore, Md. The terminal is made of metal and is arranged for clamping to the messenger strand. A nipple for the wires is connected directly with the cable sheath. The leading-in wires connect to binding posts outside the box, the other ends of which, inside the box, serve as fuse mountings. Similar posts for the cable wires serve for the second end of the fuses. A block of carbon, which is grounded, lies between these fuse posts. A saw slot in the carbon receives a gutter of mica within which the fuse wire is placed. A perforation in the mica permits discharges from the fuse to the ground.

With automatic systems having message-rate service it is necessary to count each call. At times there are calls which should not be paid for according to current custom. To provide for these is the object of the invention of Mr. M. L. Johnson, of Chicago. He provides a special operator who may be reached without charge and she determines whether or not to let the call go through free. Mr. Johnson has assigned his patent to the Corwin Telephone Manufacturing Company.

To the Automatic Electric Company has been assigned a patent granted to F. Newforth, of Chicago, Ill., for a special arrangement of circuits by means of which the line wires may be connected directly to the contact banks instead of being carried through a normally open cut-off relay. This latter practice was adopted so that the line relay of a called line would not be affected by ringing on that line. The desired result is attained by associating a cut-off relay with a ringing relay and by making the action of the latter very slow so that the cut-off will always occur first.

Intercommunicating Systems

Messrs. W. P. Andrick, Edgar Lowe and H. W. Huff, all of Jamaica, N. Y., are the joint inventors of a key for intercommunicating systems. This key has a number of units set in a row. Each unit has two operative positions for each of which a mechanical lock is provided. The latter consists of a bar which engages a notch in the key lever block. The bar is raised when the hook lever is depressed, and all keys are restored to normal.

Letter to the Editors

Conserving Initiative

To the Editors of the Electrical World:

Sirs:—At first blush it is rather hard to understand why so much interest has been aroused recently in the conservation of our water-powers. At recurring sessions of the legislatures of our different states bills are introduced to do this, that or the other thing for the conservation of the water-powers, and the federal government, in its desire to conserve, has fairly run amuck. Now, one doesn't have any quarrel with conservation of anything, provided the conservation really conserves; but anyone may have a very legitimate quarrel with conservation of the less important things, especially when that conservation is at an expenditure away out of proportion to the results attained.

This brings us back to the initial query: Why all this fuss about the conservation of water-powers? The food products utilized by the average citizen are produced in a manner quite the antithesis of conservative, and yet pretty close to a quarter of the average family's income will have to be spent in buying the mere food supply. Why, then, in the interest of humanity, in the interest of conserving human happiness and human energy for useful labor, should we not be making a much greater fuss for the conservation of farm labor, the conservation of food products, the conservation of the soil, conservation through the proper selection of vegetable and animal types, and so on?

Every article consumed by John Henry, the typical "man in the street," is 90 per cent the product of labor, the other 10 per cent being supplied by stored labor, commonly known as capital, and yet the enthusiastic conservationist has not to date aroused any great public clamor for a conservation of labor through more intelligent and skilful direction.

It is pretty unscientific to venture an assertion not based on definite possession of facts, yet one is safe in saying that the average efficiency of application of labor to the production of *useful* commodities is not markedly above the 25 per cent point.

The actual fact is, of course, that we can see water being wasted, sometimes even when it is not, while it requires pretty close observation to discover the fact that a very busy artisan is perhaps accomplishing next to nothing as a result of all his busy-ness. That seems to be the whole story. Wastes of water-power are conspicuous and spectacular. Much worse wastes in other directions are not conspicuous at all.

And so it comes that the State of New York has to-day before its Legislature three proposed bills for conserving the water-power resources of the State, and so an active propaganda of publicity is being carried on by the extreme advocates of conservation to indicate to the taxpayers, and particularly to the small taxpayer, that through the conservation of our water-powers we may expect cheap, almost costless, light, power and heat.

This publicity campaign has aroused John Henry. It has gone further; it has inflamed him. He has been taught to believe that if he can get this same cheap power through the conservation of our water resources, all his economic disabilities will pass away.

Now the writer is a firm believer in conservation. He is firmly convinced that it is wicked to perpetuate, nay, even to permit, a waste; but, speaking for the moment from the point of view of John Henry: What is there in it for him? John Henry seldom uses more than 25 kw-hr. per month at his home; and it is a fact that a modern steam generating station of 20,000 kw equipment rating, with 50 per cent additional equipment held in reserve, could pay for every speck of fixed, operating, overhead, amortization, obsolescence and every other kind of costs and still turn out energy at something less than ½ cent per kw-hr. at a fairly good load-factor.

If development of our water-powers could be accomplished without one cent of cost, and if the development of our water-powers required not one speck of transmission investment nor one single cent of operating expense, then John Henry might save 10 to 12 cents a month on his 25-kw-hr. power use by hydraulic developments as against the typical steam station.

But, in general, it is going to cost money, and it is going to take some operating labor, and there is going to be some transmission system between the developed water-power and John Henry. Some of our water-powers will at their best require steam standby to equalize flow fluctuations; most of them will require steam standby to take care of transmission interruptions, and steam standby means station labor and banked fires and steam station investment. Hence in such a case the developed water-powers may save to the man in the street as little as 2 mills per kw-hr., which for the ordinary household customer will mean a saving of 4 to 5 cents a month—surely no great place to begin the reduction in the high cost of living.

And then we have electricity on the farms. It may be set down as a pretty sure proposition that something more is needed than merely cheap power to produce electrified agriculture. There is in this case exactly the same discrepancy between the apparent cost of energy as developed and the price to the ultimate consumer as in that of the typical man in the street; namely, the cost of administration, the cost of a distributing system, and all those one hundred and one things which go to make the difference between a possible 12, 10, or 8 cents per kw-hr. to retail customers and the ½ cent per kw-hr. at the station busbars.

If to the average citizen, then, the development of our water-powers means only 5 or 10 or 15 cents a month saved from his electricity bill, it is apparent that the real conservation must come in the reduction of the cost of energy to those consumers who require a minimum of overhead and distribution expense; in other words, the large, steady high load-factor customers, the total cost of serving whom is but slightly above the cost of energy at the switchboard.

The conservation of our water-powers, then, will find its fullest justification, its highest percentage of realization, in the conservation of and for industry. Is it not entirely obvious that it is only in the industrial applications with their high load-factors and relatively low investment for distribution systems that cheap energy will do the most good? And it is not fairly patent that in such case society as a whole will benefit most widely under the assumption that the welfare of the industries must react for the benefit of all the individuals?

If, then, conservation of our water-powers is to be accomplished through industrial utilization, it is important that nothing be done in the process to kill the proverbial goose or to diminish seriously the production of golden eggs. Just this has been contemplated by several bits of proposed legislation introduced at Albany and put into operation in the Province of Ontario. In the one case state development ostensibly for conservation has been prosecuted with ruthless disregard of at least two great industries, and in the other case there is contemplated a similar destructive competition by the state with private industry in a field where every benefit of such competition might be secured by proper regulation.

There can be no question whether the industrial utilization of water-power should be accomplished through a mechanism that threatens explicitly the very existence of one great industry and holds out implicit possibilities of the state's usurping all others. I do not see how such a conservation really conserves at all.

It is a shame that we should waste the power of our streams, or, if one will, the coal which this power would supplant; but it would be a much greater shame to destroy in the very process of saving coal the human initiative which can set both labor and capital at work for the production of economic benefits to posterity.

Such destructive competition as suggested in certain of the conservation bills might easily, and, in fact, would probably through the process of duplication, destroy as much capital investment as the total value of the hydraulic power developed would represent. May we risk the use of specific figures? If the State were to develop a hydroelectric plant of 1 kw rating at an investment figure of $150, and in order to market the production of such a plant were itself to construct a distributing system parallel to one already existent, and costing, let me say, $200, the result would have been a net loss to society of human energy expended to the extent of $50.

The plan suggested by the Empire State Gas & Electric Association in its letter to the Governor of the State of New York seems to avoid most wisely the evils of such a process of duplication, with its attendant destruction of initiative and the products of the initiative of the past, while at the same time enabling the development of our water-powers for the most that may be in them, without the sacrifice by the people of the State of one speck of their equity in such powers.

Under the plan suggested by the Empire State Association, complete control is retained in the regulating bodies with absolute autonomy in the individual corporation making the development.

Perhaps the most valuable feature of such an arrangement is that it offsets the possibility of the development of a bureaucracy with the apparently inevitable characteristics of officialism.

Under the philosophy which avoids the mention of rope in the family of the victim of capital punishment, it may be in ill taste to-day to speak of the possibilities of official corruption, but we may at least speak of the certainties of officialism in the conduct of business by the body politic. The very safeguards of a civil service system, of published specifications and sealed bids which we find it necessary to throw about our democratic government in themselves prevent that elasticity, directness of operation and freedom of personal judgment that make for the best efficiency and the development of the highest type of initiative. These factors, combined with the lack of direct responsibility to the ultimate stockholder, would spell the destruction of aggressive initiative in any state distribution or electric generating scheme.

Against this the plan proposed by the Empire State Gas & Electric Association, while safeguarding public interest through regulation of the corporations, at the same time conserves initiative through the preservation of that direct relation between the ultimate stockholder and the humblest employee which makes all parties alive to the interests of the whole organization.

Let one note the contrast between a state development on the one hand and a corporate development on the other. The state is composed of so many millions of individuals, each of whom may be considered as a stockholder in a possible state development. Each of these stockholders has obviously an equity of only a few cents in any one of the power developments that might be undertaken. He has a multitude of investments as a shareholder in the various enterprises of the state. It is not probable that this interest will be tremendously keen in any one of them, nor that his voice will be very distinctly heard if raised in protection of any one of these investments.

On the other hand, in the public service corporation as at present constituted the stockholder has a relatively large part of his holdings in any one investment and is relatively a much heavier investor in any one of the concerns in which he has placed his money than he is in any one of the state's projects, therefore he will and he can keep a very close watch on the administration of the companies in which he is interested. Through that administration, transmitted through directorate and executive officers in a very simple chain, each last man in the organization is reached and stimulated to do his best to conserve the efficiency of the business, and in the process to conserve his own individual initiative. It is to this end that the plan proposed by the Empire State Association will operate, and it is because of this that the interest of all engineers should be awakened to the significance of political method as a salient feature of the work of conservation and the preservation of the standards of the engineering profession.

Rochester, N. Y. JOHN C. PARKER.

Field of the Operating Engineer

A Record of Practice, Experience, New Ideas and Interesting Problems—Notes on Practical Subjects—Questions and Answers

Data on Operation of Iron-Mine Plants

Electricity is employed by Witherbee, Sherman & Company, Mineville, N. Y., for the mining and beneficiation of their magnetic iron ore, the annual output of which is about 700,000 tons. About 80 per cent of this is treated magnetically to separate the gangue. All but about 1.2 per cent of the impurities may be removed in this manner, and from 90 per cent to 98 per cent of the iron content is recovered from the ores obtained from the Lake Champlain region. For about 25 cents per ton of marketable ore it is possible to furnish all of the energy required for mining and loading the ore on cars. This includes hoisting 900 ft., crushing to 0.25-in. or 0.125-in. lumps, and separating the gangue. The production of compressed air requires about 73.5 per cent of the energy used in mining, and milling demands about 22 per cent of the total energy consumed. The total generator rating is about 70 per cent of the motors installed, and the power required for all operations is about 60 per cent of the total motor rating. The average cost of generating energy, including depreciation of plants, is about 1.05 cents per kw-hr. Tabulated herewith is a recapitulation of the energy generated and distributed at these mines in 1913.

TABLE I—OUTPUT OF GENERATING STATIONS SERVING IRON-MINE PLANTS

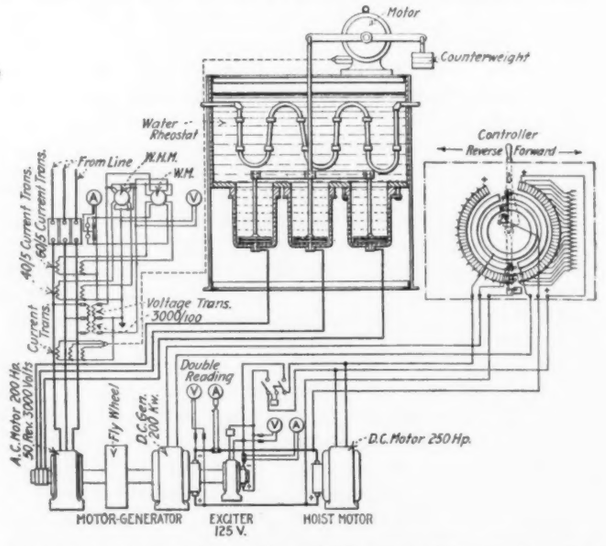
GENERATORS			KW-HR PRODUCED
Type	Kw	Volts	
Turbine	800	6,600	
Turbine	1500	6,600	7,453,700
Engine	750	3,300	
Turbine	750	3,300	4,306,800
Waterwheel	375	6,600	788,300
Waterwheel	800	13,200	1,870,700
Total	4975	.....	14,419,500

TABLE II—CONSUMPTION OF ELECTRICITY IN MINES, MILLS, ETC.

	Hp of Motors Installed	KILOWATT-HOURS		Per Cent of Full Load Rating Used
		Total Used	Per Ton Crude Ore	
Compressors	2100	7,273,365	10.5	93
Hoists	2200	1,664,956	2.5	20
Hoists—new	1200	....	....	..
Pumps	131	287,554	0.4	60
Haulage	....	212,083	0.4	54
Mine lighting	275	333,826	0.5	..
Total mining	5906	9,771,784	14.3	55
Mills	2094	2,756,408	4.1	76
Carpenter shop and sawmill	95	89,019	0.13	..
Sherman mine development	....	98,084	0.14	..
Total used	8095	12,715,295	18.77	60
Commercial purposes	1150 50	1,704,205	....	..
	9295	14,419,500	....	..

Control Equipment for Hoist Operated from Flywheel Motor-Generator

As acceleration is an important consideration in electric hoisting, a variable-voltage-control system is usually preferable. Illustrated herewith is a method of automatically starting and regulating the speed of a hoist motor receiving energy from a flywheel motor-generator set. A shunt-wound motor is used for hoisting in this particular case, and its speed is regulated by a liquid rheostat connected in the secondary circuit of the induction motor driving the generator.



CONTROL EQUIPMENT FOR HOIST OPERATED FROM FLYWHEEL MOTOR-GENERATOR

The three phases of the rotor are connected to stationary plates fastened in the bottom of three separate earthenware vessels containing an electrolyte. Above these plates are three movable ones which are electrically and mechanically connected. The movable electrodes are supported from a lever which is counterweighted and automatically tilted by a small induction motor to regulate the current through the motor driving the generator. If the alternating-current motor receives a larger current than it should (this value may be predetermined and fixed by adjusting the series transformers feeding the rheostat motor) the small motor will raise the rheostat plates and increase the resistance in the rotor circuit. This decreases the motor speed and permits the flywheel to give up some of its stored energy. The foregoing method of control was described in a paper presented at a recent meeting of the A. I. E. E. at Pittsburgh, Pa., by Mr. Harrison P. Reed.

Methods of Handling Electrical Troubles in Cleveland

In the new building of the Cleveland (Ohio) Electric Illuminating Company two rooms have been given over to a department which attends to customers' troubles. Ordinarily only one man is on duty, and he receives all telephone calls from consumers, repair crews and emergency trouble men and assigns work to the men making repairs. This "trouble dispatcher," as he is termed, is surrounded with many interesting devices and aids, which make up a complete system of caring for troubles and checking the movements of the various men in the department.

On a glass-top table near the trouble dispatcher lies a map showing the city divided into eleven districts and each district into sections, of which there are sixty in all. Locations of all repair men and trouble crews are kept constantly before the dispatcher by means of name cards of different colors attached to vacuum stickers and placed on the glass top over the map. The color of the card denotes the type of conveyance which the man is using, namely, a horse, an automobile or the street cars. When any crew is not at work its position in garage, substation or office is also denoted by the vacuum sticker, which is removed to a labeled compartment at the side of the map.

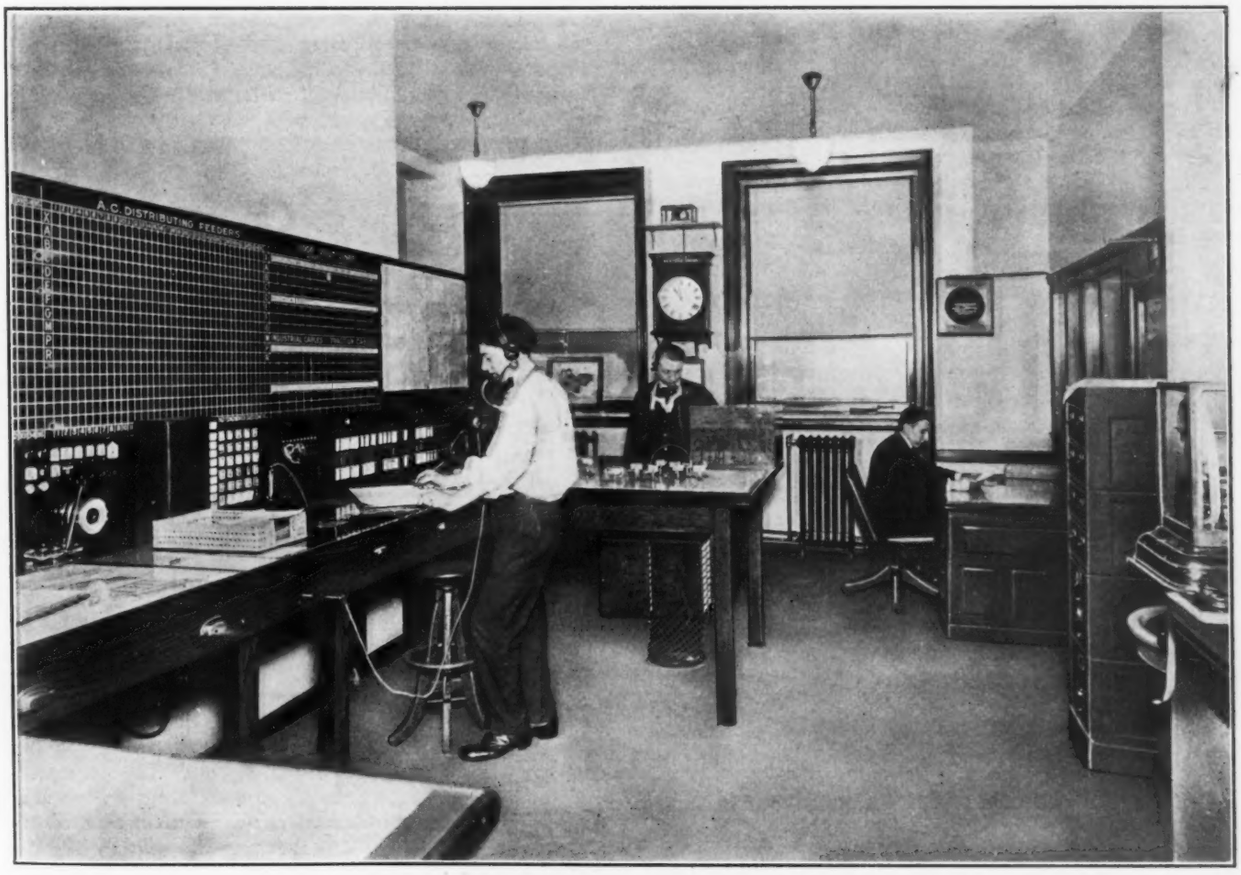
Record of Circuits and Substations

Each substation on the company's system is lettered and the arc-lamp circuits are designated by number. Trouble on any arc-lamp circuit is denoted by a tag which is hung at the intersection of the lines on the blackboard drawn from the letters and from the numbers, as shown in the accompanying illustration. Colored and lettered tags denote whether the line is open or grounded, whether linemen are at work or whether there is a "live cross." Alternating-current distribution-feeder troubles are handled in much the same manner.

Another blackboard in front of the operator carries the position for each 11,000-volt feeder in the company's system. Thus, if the dispatcher is notified of trouble on an 11,000-volt inter-station cable connecting substation A and substation W, he puts a numbered red tag on the square in the board designated as AWV. Here the letters A and W represent the substations between which the trouble occurred, V indicates that the cable was operating at 11,000 volts, and the number on the red tag corresponds with the cable number. If the underground department wishes to work on any of these cables, it must notify the trouble dispatcher by letter. A black tag bearing the words "Hold off" and the number of the cable on which the men are working is then placed upon the board before the operator. Industrial motor-service and traction cables are designated on a similar blackboard by the name of the factory or substation which they serve. A similar system of tags is used to denote trouble or unusual conditions on these cables.

Operation of the System in Times of Emergency

Under ordinary operating conditions records are kept on a daily trouble sheet by the single trouble dispatcher in charge. In case, however, a severe storm arises, all incoming calls are handled through a switchboard in the adjoining room, at which there are six operators' positions. These operators take down on white, blue, red and varicolored slips the consumer's name and details of troubles reported. These slips in-



DEVICES AND AIDS FOR CHECKING MOVEMENTS OF REPAIR AND EMERGENCY CREWS AND CARING FOR TROUBLES

dicate respectively "no light," "no power," "wires down," "poles down" and "serious trouble." The slips are then passed through a window to the trouble dispatcher's room. Here they are received by a checker, who eliminates duplicate calls and adds the number of the district and section and numbers each case of trouble. After being classified, these colored slips are placed in pigeonholed compartments according to the district and section of the city in which the trouble has occurred. From this box the chief trouble dispatcher assigns cases to repairmen out in the various parts of the city and places the colored slip in another box to designate that the work has been given out to the troublemen.

A similar system is also used for the telephone reports from troublemen, who upon calling state their name, district and section number, call number, the time the trouble was cleared, details of trouble, and what was accomplished. These facts are set down by the assistant receiving the call.

Prompt Assistance in Accident Cases

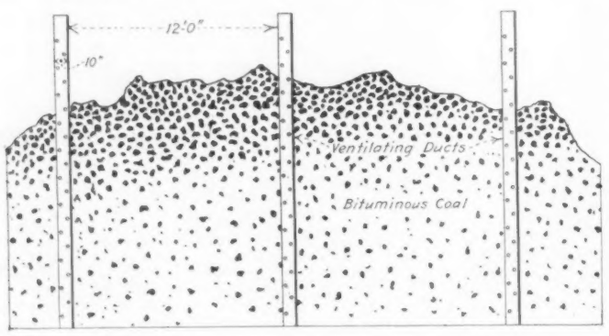
When accidents occur to the company's linemen or to persons coming in contact with live wires the case is handled by the trouble dispatcher in the office. His first duty is to give to the foreman who has reported the accident preliminary instruction as to the care of the injured person, to which hospital he is to be sent, etc. The dispatcher then calls the nearest ambulance, as denoted by colored stars on the map of the city, and then summons in turn the pulmotor operator, a physician, the nearest hospital, the construction superintendent and others whose services are required. Following a recent case in which a lineman received a severe burn the trouble dispatcher completed all of these calls in the record time of fourteen minutes.

In addition to the duties enumerated above, the trouble dispatcher watches the fire-alarm ticker in the office and dispatches men to the scene of any fire where the company's lines are likely to be involved.

The trouble dispatcher is indeed an important factor in the Cleveland company's organization, as it is he who must at all times keep in touch with the company's customers and direct the efforts of the men endeavoring to keep the company's service as good as human endeavor can make it.

Ventilating Coal Pile to Prevent Spontaneous Combustion

In preparing for the biennial bituminous coal miners' strike in the Middle West the Swinehart Tire & Rubber Company, Akron, Ohio, has adopted a scheme



STORING SOFT COAL WITH VENTILATING DUCTS

whereby it is hoped all danger from spontaneous combustion of the fuel will be eliminated. At 12-ft. intervals throughout an 800-ton pile of coal vertical vent pipes have been placed. These ducts, consisting of a square box made up of 10-in. boards in which 1-in. holes have been bored on 6-in. centers, are placed upright on the site to be used for coal storage and the fuel is dumped about them. Carrying off the heat and gases formed in the interior of the stored coal, thus preventing undue rises in temperature and formation of gas pockets, is the chief function of the wooden ventilators. Mr. H. L. Houk, purchasing agent for the Swinehart Tire & Rubber Company, says that the experience of the company with run-of-mine coal has shown that spontaneous combustion need not be feared with vent pipes placed vertically on 12-ft. centers. However, if slack coal is to be stored, Mr. Houk says he believes it would be good policy to install horizontal vents leading to the vertical risers.

Pitting of Mica Between Commutator Segments

What is the cause of the pitting or burning out of mica between commutator segments at or near the end of the commutator? The leads to the segments are not loose and the burning occurs in rings from 0.125 in. to 1 in. wide. The mica is charred and the pitting sometimes extends down to the clamping ring where the segments finally become grounded. At the time of starting the motor a ring of fire encircles the commutator but usually is extinguished when the motor reaches full speed. What compound can be employed to fill up the spaces between the segments?

F. C. F.

It is probable from the location of the pitting that the trouble is due to oil from the shaft bearing collecting on the end of the commutator, ensnaring carbon dust from the brushes, and thus bridging the segments. The short-circuit current, together with the peripheral speed of the commutator, probably rids the mica spacers of the carbon dust after the motor has operated a while. After cleaning out the pitted mica with a metal file the space can be filled in with a mixture of powdered mica, with shellac or an insulating varnish. To avoid any likelihood of this trouble recurring it will be advisable to examine the bearing for escaping oil, to provide means for collecting or eliminating such oil as may escape.

Radio-Telegraph Masts and Coils

Please give me some information concerning certain radio-telegraph problems, as follows: (1) What height should the mast be for a circuit of 12 miles, with trees intervening? (2) How many wires should be used in the case? (3) Is a 1.5-in. coil on 70 volts large enough to send a distance of 12 miles? D. T.

It is not possible to define permissible working distance by radio-telegraphy in terms of antenna height, secondary spark-length and primary voltage of induction coil, number of antenna wires and existence of trees between the proposed stations. A 1.5-in. spark coil operating on 70 volts if used in connection with well-designed and carefully tuned oscillation circuits should be able to signal easily over 12 miles of average land, if at the receiver there is used a good crystal or electrolytic detector in conjunction with properly built and adjusted tuning circuits. Suitable antennas would be either an umbrella of four or six 60-ft. rib wires guyed well out from a 60-ft. pole and fed at the top, or a four-wire flat-top slung on 12-ft. spreaders between two 50-ft. masts something over 120 ft. apart, and fed at one end. It must be borne in mind that successful operation will depend far more upon careful design and adjustment of the instruments than on following absolutely the figures here given, which, of course, are not invariable.

Digest of Current Electrical Literature

Abstracts of Important Original Articles Appearing in the Periodical Electrical Press of the World

Generators, Motors and Transformers

Commutation Losses of Direct-Current Machines.—LUDWIG DREYFUS.—An article illustrated by diagrams on the additional commutation losses in direct-current machines. The author discusses the phenomena of interruption of current and commutation first for the case of one conductor per slot and then for the case of any number of conductors per slot and summarizes the laws of the additional commutation losses thereby obtained.—*Elek. u. Masch.* (Vienna), April 5 and 12, 1914.

Three-Phase Motors.—MAX BRESLAUER.—An illustrated article in which the author shows how to find in a series armature those tapping coils which are needed in order to obtain a three-phase winding without having to make a complete drawing of the whole winding scheme. The chief results of the paper are given in two tables, and the method is applied to two examples.—*Elek. Zeit.*, March 26, 1914.

Three-Wire Generator.—A note on a recent British patent (No. 5926, 1913) of F. Newton and Newton Brothers. The machine acts as an auto-transformer, balancer, booster or three-wire generator. The armature winding span is $1/3n$ of the periphery where n is the number of pairs of poles, also spaced a distance of $1/3n$ apart, in combination with $3n$ brushes symmetrically spaced. Interpoles are provided. The main poles are compound-wound.—London *Elec. Eng'ing*, April 9, 1914.

Phase Advancer.—The first Kapp "vibrator" or phase advancer has been built and recently put into regular commercial operation in connection with a 330-hp induction motor in England. The vibrator consists of a magnet frame carrying three sets of two-pole field magnets, in which revolve three armatures of the usual direct-current type. The three armatures are connected in mesh to the slip-rings of the induction motor as shown in Fig. 1, which also shows all the necessary connections (although in some cases it may be desirable to provide an interlocking arrangement to prevent the motor from being started with the vibrator in circuit, that is to say, practically on short-circuit). The field windings are excited with direct current. The low-frequency rotor currents in the armatures cause the latter to rotate first in one direction and then in the opposite direction with the frequency of slip. This rotation induces in each armature voltage which is opposed to the emf of self-induction of the motor and is greater than the latter by an amount sufficient to supply through the resistance of the rotor windings the necessary current to produce the magnetic field of the motor. With normal excitation of the vibrator no magnetizing current flows in the stator windings, and consequently the motor operates with a power-factor of unity. If the exciting current be increased, the greater voltage then induced by the rotation of the armatures will produce in the rotor windings a magnetizing current greater than that necessary to produce the magnetic field of the motor, and consequently a leading current will result in the stator windings. At half load the power-factor was 0.99 leading and at full load 0.96 leading. The corresponding power-factors without the vibrator were 0.76 lagging and 0.87 lagging respectively. The machine was guaranteed to give unity power-factor from half load to full load, and when the field current was adjusted for the latter value the excitation loss in the field coils of the vibrator was only 50 watts. The vibrator will work equally well with an induction machine running either as a motor or a generator without change of connections, so that when used with machines driving winding engines or locomotives complete compensation would be obtained under all conditions. The vibrator not only gives the power-factor but also increases the overload capacity and maximum torque.—London *Elec. Review*, April 10, 1914.

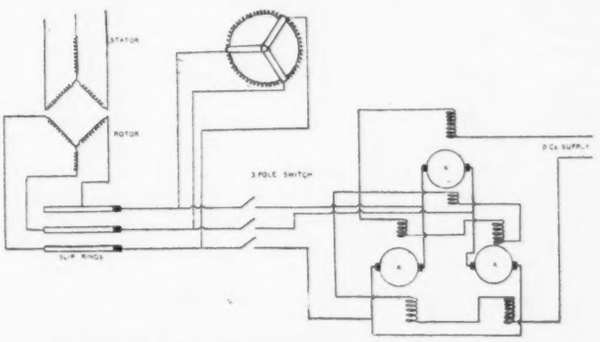


FIG. 1—DIAGRAM OF VIBRATOR CONNECTIONS

Lamps and Lighting

Sintering Tungsten for Lamp Filaments.—A note on a recent British patent (No. 14,795, 1913) of R. B. Walling and the General Electric Company of this country. The broad claim is for sintering metal rods by mounting them without lateral confinement, so that the sintering current can be passed throughout their entire length, whereby the whole rod can be raised to a sintering temperature in an inert atmosphere. The cooled contacts at the ends of the rod are arranged so that they automatically approach and exert sufficient pressure on the rod as it contracts. One of the contacts is floated in mercury for this purpose.—London *Elec. Eng'ing*, April 9, 1914.

Generation, Transmission and Distribution

Ground Wires.—E. PFIFFNER.—An article illustrated by diagrams discussing the principles on which a ground wire is an effective protective device.—*Elek. u. Masch.* (Vienna), March 29, 1914.

Protection Against Dangerously High Voltages.—H. GEWECKE.—In high-tension plants the transformers, the relay coils of oil switches, etc., are liable to be damaged by dangerously high voltages. Effective protection can be obtained by shunt resistors which cause errors of less than 0.5 per cent in the transformation ratio of the transformer. Such shunt resistors are preferably made of silit (silicon carbide). Silit plates are superior to rods.—*Elek. Zeit.*, April 2, 1914.

Protection Against Dangerous Rises of Voltage.—W. PREHM.—The author gives results from practice

showing that the protective devices at present available for protection against traveling waves are not as effective as supposed. The author thinks that it is prohibitive to use the condenser as a protective device in extended transmission systems on account of the high first cost and high maintenance cost and the lack of effective protection against traveling waves. The best protection is to provide a sufficiently high insulation of the transformers. The coils where the current enters should be as well insulated as possible.—*Elek. Zeit.*, April 9, 1914.

Traction

Constantinople.—P. Poschenrieder.—An illustrated article on electric traction in Constantinople. The power plant which is in course of erection will contain three steam turbines, each of 10,000 hp, coupled to a 10,500-volt, three-phase generator. The three-phase energy is transmitted to three substations, where transformation to 550-volt direct current takes place.—*Elek. u. Masch.* (Vienna), March 22, 1914.

Installations, Systems and Appliances

Small Three-Phase Station.—Chr. F. Weiland.—An illustrated description of the arrangement of a small station employing three-phase currents at fifty cycles without neutral wire, with a voltage of 220 volts. It supplies current to a well-to-do village of 2000 inhabitants. The plant consists of two generators each of 10 kva. To supply current during the night a storage battery is provided. The arrangements, which are made in such a way that a single unskilled laborer may attend to the plant, are described and illustrated by diagrams, and figures are given on the cost of operation.—*Elek. Zeit.*, April 9, 1914.

Water Rheostat.—An illustrated description of a water rheostat devised by O. H. Sachers, used in tests in a power plant. The construction is shown in Fig. 2. The tank, of concrete or wood, contains vertical stoneware tubes *T*, through which the water passes upward, flowing over at the top. Three such tubes are provided for a three-phase system. At the bottom of each of the tubes is a small iron sheet *RS* which can be pushed in more or less so as to adjust the quantity of water entering at a certain time. These three iron sheets and

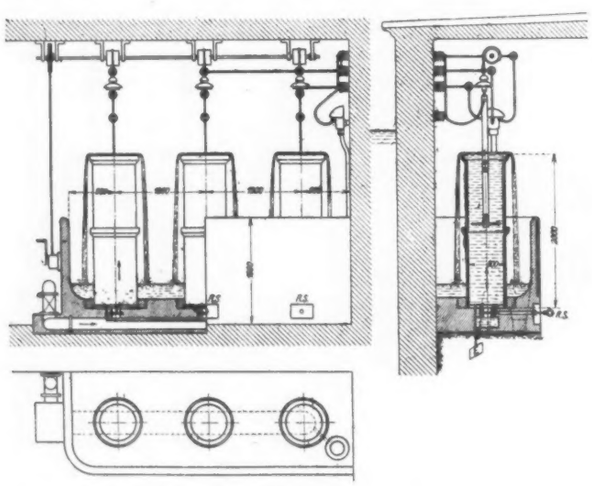


FIG. 2—WATER RHEOSTAT FOR POWER-PLANT TESTS

the connections at the bottom are carefully earthed to prevent any danger to the attendant. The electrode consists of copper wire wound in a flat spiral so that the water vapor can easily rise upward. This form also prevents formation of sparks such as would occur if pointed electrodes should be used. By adjusting the height of the water level the load can be adjusted between 100 kw and 2600 kw. The construction may also be modified by putting a tube of smaller diameter within each of the main tubes so that the water rises upward in the center tube and flows down in the space between the two tubes. In this case the same resistance can be obtained with one-half the height of the rheostat.—*Elek. Zeit.*, April 2, 1914.

Wires, Wiring and Conduits

Copper for Conductors.—The new standardization rules of the German Association of Electrical Engineers on copper for conductors require that such copper must not have a higher resistance than 17.84 ohms per km length and square mm cross-section at 20 deg. C. The resistance of a conductor of 1 km length and 1 square mm cross-section increases by 0.068 ohm per degree C. increase of temperature. The international agreements reached by the I. E. C. are also added.—*Elek. Zeit.*, March 26, 1914.

Standardization Rules for Insulated Wires.—A new set of standardization rules for insulated wires prepared by the German Association of Electrical Engineers. These regulations will be in force beginning with Jan. 1, 1915. There are three chapters. The first relates to rubber-insulated wires, giving general notes and regulations on the construction and testing of the wires. The second chapter deals with lead cables (rubber lead-covered cables and paper or fiber lead-covered cables). The third chapter gives tables of the highest load which insulated wires are permitted to carry, both for copper and aluminum.—*Elek. Zeit.*, March 26, 1914.

Suspension Insulators.—Reinhold Rüdenberg.—An illustrated article in which the author calculates the non-uniform distribution of the voltage over the different disks connected in series one above the other in a suspension insulator. The distribution of the voltage is illustrated by means of curves which show the unfavorable effect of high capacity to earth of the insulator disks. A method is given for determining the most favorable number of disks for suspension insulators.—*Elek. Zeit.*, April 9, 1914.

Electrophysics and Magnetism

Spectra of the Elements and the Structure of the Atom.—J. W. Nicholson.—A highly mathematical paper in which the author refers to the paper by H. G. J. Moseley on some experiments giving a new order of simplicity to the determination of wave-lengths of the characteristic X-radiation emitted from metals, and supplying perhaps the most hopeful way of obtaining a more intimate knowledge of the inner structure of the atom and of the essential relations between the various elements. He also refers to another paper by Bohr and to the supposition that his formula for spectra, applied to the steady states of an inner ring of four electrons rotating round a nucleus whose charge corresponds to the "atomic number" of the element, will account for the principal line found by Moseley in the X-ray spectra of the elements from calcium to zinc in the periodic table. The present paper is not intended as a criticism of Bohr's theory of the origin of spectra in general and of the hydrogen and helium spectra in particular, but it puts forward the view that this particular application of the theory cannot be made in the manner contemplated, without a serious conflict with the recent results obtained by Rutherford Barkla and others as to the number of electrons in atoms, which seem to indicate that the number is about half the atomic weight.—*Philos. Mag.*, April, 1914.

Induction Coil Potentials.—E. Taylor Jones.—A third mathematical paper on this subject. The author

gives some further applications of the theory of electrical oscillations in coupled circuits. On the whole, the evidence tends to show that the theory described in this and the two former papers is sufficient for the calculation of the secondary potential of an induction coil and the most effective value of the primary capacity.—*Philos. Mag.*, April, 1914.

Thermal Electromotive Forces in Oxides.—CHARLES C. BIDWELL.—An account of an experimental investigation the results of which are given in tables and in a thermo-electric power diagram for various oxides. This diagram brings out some interesting facts: First, the Tait diagram may be extended to include the oxides. Second, the thermo-electric powers for the oxides are of far greater magnitude than for the metals. Above 1000 microvolts per degree are recorded for some oxides, while for the metals 100 microvolts per degree is extreme. It may or may not be significant, but as a general rule both on this diagram and on the Tait diagram for the metals thermo-electric powers are high where resistances are high.—*Phys. Review*, March, 1914.

Valency of Radio-Elements.—G. HEVESY.—An account of an experimental investigation the chief results of which are as follows: The valency of fifteen radio-elements was determined by measuring their diffusion constants in acid solution. The valency thus measured directly agrees without exception with what would be expected from the character of the respective radio-elements determined by their non-separability from an element of known properties. Actinium sends triple charged ions into solution. This fact supports the view that actinium is the subsequent homologue of lanthanum. In alkaline solutions the short-lived and long-lived products of the emanation are present in a colloidal state, in agreement with the views of Paneth and Godlewski. Polonium, in very weakly acid solution and in neutral solution, is also present in a colloidal condition. These particles of the radio-colloids contain in some cases only two or three atoms. The possibility of separating chemically identical elements is discussed.—*Philos. Mag.*, April, 1914.

Electrochemistry and Batteries

Model of the Structure of the Atom.—E. R. LYON.—A paper on an extension of Professor Mayer's experiment with floating magnets. The experiment with floating magnetic needles and an attracting bar magnet, known as Mayer's experiment, has been frequently cited, as demonstrating the periodic grouping of a number of mutually repelling bodies restrained by a central force. This experiment is often shown as an illustration of Sir J. J. Thomson's theory of the atom, according to which the negative electrons are arranged in concentric rings in a positive sphere. The floating magnets take the place of the electrons and a bar magnet above them takes the place of the positive sphere. In the initial experiments a glass battery jar was employed for a container, and it was observed that if the attracting bar magnet were removed the floating magnetized needles would mutually repel one another to the wall of the jar, where they remained, held partly by their repulsion and partly by the surface tension of the water. It was further observed that nearly a solid ring of magnets could thus be formed, and that the inward directed repulsion from this ring was, especially with respect to symmetry, even more efficacious in the formation of the Mayer groups than was a centrally attracting bar magnet. Following this lead, a coil of wire of the same depth and position, and wound upon the outside of the jar, was substituted for the ring of magnets. This coil had forty turns of No. 18 enameled wire, and a current of from 0.25 amp to 0.5 amp was passed through it in such a manner that the magnetic field should repel the floating magnets toward the center of the jar. With this device it was observed that still more symmetrical groups could be obtained, and that, furthermore, groups of as high as thirty and forty needles could be easily studied, without any of the inconvenient over-concentration at the group center and sticking together of pairs of needles, such as had been observed when using the suspended bar magnet to produce the central force. With a sufficiently large tank and repelling coil any sized group can be stated in this way. Results of experiments are given and applied to discussion of Mendeleef's table of elements.—*Phys. Review*, March, 1914.

Units, Measurements and Instruments

Electromagnets.—ERICH JASSE.—A continuation of his former paper on the design of electromagnets. The author deals with rotary magnets such as are used in apparatus and switch construction and discusses the case in which the armature of the electromagnet is provided for a special winding. He shows that with a wound armature it is possible to make the torque four times the value for an unwound armature and the angle of rotation twice the value for an unwound armature. For calculation it is sufficient to consider the conditions in the air-gap only, and in order to take into consideration the saturation it is only necessary to determine one characteristic curve. The results of measurements agree sufficiently well with the theory to lend it support.—*Elek. u. Masch.* (Vienna), March 22 and 29, 1914.

Electrostatic Voltmeter.—JAC. SCHAFFIT.—An abstract of a thesis on a new electrostatic voltmeter of Peukert in which the rotation of a dielectric in a rotary electric field is used. The dielectric has no real hysteresis, but only viscous hysteresis, besides a certain conductivity. As shown in Fig. 3 a glass rod *B* is mounted on a marble plate *A*, and from the tube at *E* is suspended a platinum-iridium wire of 0.1 mm diameter and 23 cm length, which has at its lower end a hard rubber axle of 6 mm thickness carrying the dielectric cylinder *Z* of 4 cm diameter and 2 cm height. The

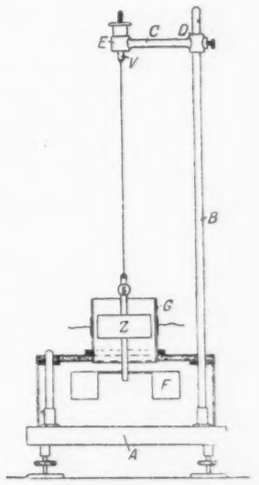


FIG. 3—ELECTROSTATIC VOLTMETER

small mirror *S* is provided for reading the deflection. *F* is the damping vanes. The cylinder *G* of glass (5 cm diameter and 2 mm thickness) is arranged concentrically around the dielectric and is covered with several pieces of tinfoil arranged at constant distances. They have a height of 2 cm. Opposite pieces of tin-

foil are connected with the high-tension side of the three-phase transformer while the centers of the high-tension coils are connected with the zero point of the low-tension side and earth. In the experiments the frequency could be changed between twenty-five and sixty. The theory shows that the dielectric hysteresis gives only a braking torque, while the driving torque is due to the conductivity. Experiments were made with dielectric cylinders of hard rubber, rubber, porcelain and mica. Mica and porcelain give greater torque than rubber and hard rubber. The instrument must be protected against draft and the humidity of the air. If the proportions are correctly chosen, the deflection of the instrument is proportional to the voltage if the frequency remains constant. On account of its low watt consumption and its high perforation resistance, this voltmeter can be used for measuring high three-phase voltages.—*Elek. Zeit.*, April 9, 1914.

Telegraphy, Telephony and Signals

Munich.—WILHELM SCHREIBER.—The conclusion of his illustrated article on the new long-distance exchange at Munich.—*Elek. Zeit.*, April 2, 1914.

Progress of the Baudot System.—A. C. BOOTH.—Duplex working of the Baudot system continues to yield the excellent results that were obtained from the sets installed at the Central Telegraph Office in 1910. The quadruple duplex on the underground loop circuit between London and Birmingham gives a uniform daily output of some 3600 messages in twelve hours, including the slack hours of the early morning and late evening. Occasionally the daily total has exceeded 4000, while on the day following the fire at the test box of the central telegraph office, London, in August, 1912, the following results were obtained between 10 a. m. and 5 p. m.: There was an average of 550 messages per hour, or 68.75 per channel, making a total of 3851 in seven hours, or 5025 in twelve hours. There was a maximum of 575 messages between 10 a. m. and 11 a. m. The new quadruple duplex sets are fitted with motor-driven receivers having tablet connections for readily changing the entire receiver whenever necessary. During the period of nearly four years that the sets have been working not more than six serious stoppages have occurred; hence it does not appear necessary at present to provide two distributors at each end. On comparatively short lines the time of propagation of a signal over a line is small, but on the long circuits with one or more repeaters, such as on the London-Berlin double-duplex circuits the propagation time ranges up to four segments or 120 deg.—that is, about one-ninth of a second—and varies some 60 deg., apparently in accordance with the way in which the relays and repeaters are adjusted.—London *Electrician*, April 10, 1914.

Portable Wireless Apparatus.—PHILIP R. COURSEY.—An article on recent advances in the design of portable wireless-telegraph apparatus. Instead of stations mounted in cars as employed in the Russian-Japanese war, stations transported by pack horses are now used. In order to secure secrecy of communication as far as possible the waves emitted by the transmitter were formerly very sharply tuned, but the practice is now the reverse, namely, to use a transmitter that is not very sharply tuned—that is, one having a flat resonance curve—while the receiver is arranged to be as sharply tuned as possible so as to be able to differentiate between different transmitting stations to the utmost degree.—London *Electrician*, April 10, 1914.

Wireless Telegraphy on Board Ship.—H. THURN.—An illustrated description of the wireless-telegraph equipment of the steamship *Imperator.*—*Elek. u. Masch.* (Vienna), March 22, 1914.

Book Reviews

HIRSCH-WILKING ELEKTRO-INGENIEUR KALENDER. 1914. With notebook supplement. Berlin, Germany: Oscar Coblentz. 386 pages, illus. Price, 2.50 marks.

This is the fourteenth annual edition of a handy engineer's pocket-book. It is divided into fifteen sections dealing with the following topics: Tables; station construction; choice of machinery; prime movers; mechanical power transmission; electric generating stations; conductors; substations; power distribution; electric railways; economics; laws and regulations; first aid to the electrically injured; tariffs; costs. The book is especially well developed on the side of costs, expenses and economics. Although designed for the electrical engineer, it is likely to be also of service to mechanical engineers acquainted with the German language and interested in German practice.

DIE ELEKTRISCHEN METALLFADENGLÜHLAMPEN. By C. Heinrich Weber. Leipzig, Germany: Dr. Max Jänecke. 454 pages, 216 illus. Price, 16 marks.

A good textbook on the history, chemistry, construction and testing of incandescent lamps, especially with relation to metallic-filament lamps. The book is divided into two principal chapters. The first deals with the historical development of the metallic-filament lamp, and the second with the tungsten lamp. The book is particularly well prepared from the standpoints of the chemical and mechanical manufacture of the metallic filaments. The successive steps in construction are abundantly illustrated. It will recommend itself to all who are interested in the manufacture of lamps in Europe and who are acquainted with the German language. An extensive subject index makes the book the more useful as a reference volume.

HANDBOOK OF TECHNICAL INSTRUCTION FOR WIRELESS TELEGRAPHISTS. By J. C. Hawkhead. London: The Marconi Press Agency, Ltd. 296 pages, 169 illus. Price, 3s. 6d.

This book was written as a guide for radio operators using British Marconi apparatus or intending to qualify for the British Postmaster-General's examinations. The ground covered is perhaps unnecessarily large, since to touch upon all the subjects noted requires a sketchy treatment which is of little use to the beginner. The entire first section of the book, given over to theoretical considerations, appears to be more suitable for use as a radio-school textbook than as part of a manual for self-instruction. The illustrations are rather crude, though in most cases they indicate clearly the essential points. Part II contains a discussion of electrical and other wave motions and states several of the relations between frequency, wave-length, decrement and circuit constants. If the groundwork of the first ten chapters were a little more thorough, this section should be of much value to the unassisted operator or student, but as now introduced the lack of system in employment of units and symbols is likely to prove confusing. Nevertheless, the final chapter of Part II, on receiving circuits, contains one of the clearest explanations that have been published as to the function of a magnetic telephone receiver in translating the energy of incoming signal waves. Part III of the book, which is given over to a detailed description of standard ship sets according to English practice, will be useful to those who handle this type of apparatus. It is not likely that data for adjustment of these instruments will help American operators, though many of the general instructions are excellent.

New Apparatus and Appliances

An Illustrated Descriptive Record of Recently Developed Manufactured Products of Interest to Electrical Readers

Small Switchboard Ammeters and Voltmeters

A 5-in. direct-current indicating meter for small isolated plants, yachts, battery-charging panels, etc., is shown herewith. The meter is equipped with a moving coil and a permanent magnet and it operates on the d'Arsonval principle. The complete moving parts are

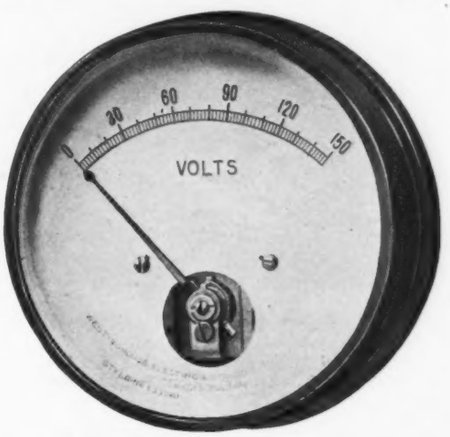


FIG. 1—EXTERIOR OF DIRECT-CURRENT METER

mounted in the case as a unit. The moving element can be released by removing two screws on the side of the pole-piece support. The entire moving element with its bearings can then be lifted out and can be replaced as it was before. The meter may be repaired, therefore, without disturbing the alignment of the magnetic circuit. An aluminum pointer makes the use of a light

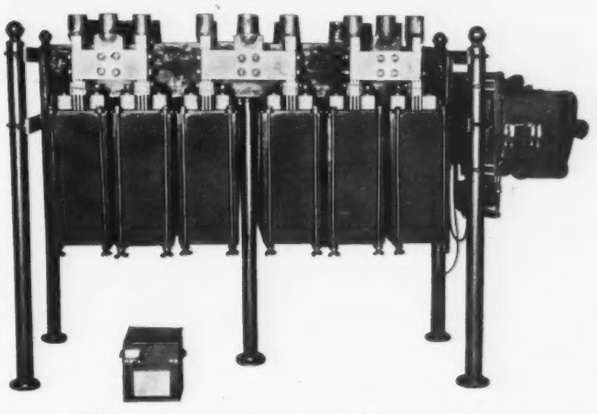
FIG. 2—INTERIOR OF DIRECT-CURRENT METER

counter-weight possible. The scale is 4 in. long, and the full length of the pointer shows on the dial. The movement is thoroughly damped to secure dead-beat readings. This meter is manufactured by the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa.

4000-Amp Oil Switch

A 4000-amp oil switch, declared to be the largest of its type in this country, has recently been put into service at the plant of the Ludlow Manufacturing Associates, Ludlow, Mass. The switch is used for the control of a 2500-kw, three-phase, forty-cycle, 575-volt turbine-driven alternator operating with a power-factor of 80 per cent and at approximately 4000 amp per phase.

Two switch elements are arranged in multiple for each pole. The stationary contacts are made of large blocks of copper. The live parts are supported by insulators clamped to the main frame. All the parts through which the switch terminals pass or which are surrounded by the electric circuit are made of composition material. Each pole of the switch is provided with three terminal lugs to accommodate three 1,400,000-circ. mil rope-core cables. The moving contacts are of the laminated-brush type and are sectionalized, each



4000-AMP SWITCH FOR 2500-KW TURBINE

part bearing independently on the stationary contact. Auxiliary contacts of non-arcing metal are provided for the arcing that occurs in making or breaking the circuit.

The tanks are of boiler iron and are electrically welded. Instead of being supported at the top to the frame, these tanks are held up by long rods bolted through lugs welded onto the tank bottom and attached to a deflector plate at the top which is attached to porcelain insulators. This deflector plate prevents the throwing of oil and it also serves as a guide for the brushes.

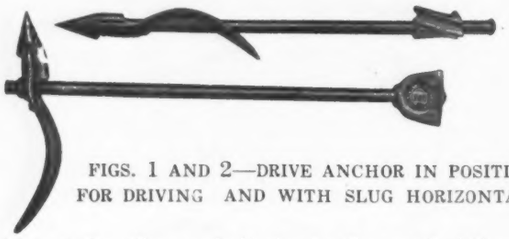
A test showed that the variation in contact resistance of the two legs of the switch was about 5 per cent. On a heat run of five and one-half hours with a load of 4000 amp the temperature rise of each leg was 26.5 deg. C. and the current density 660 amp per sq. in. The tanks showed a temperature rise of 18 deg. C. except on the adjacent faces, where on account of the total flux of the two conductors there was a rise of 31 deg. C. The switch withstood a pressure test of 10,000 volts between the terminals and the frame, and the operating coils withstood a pressure of 1000 volts between windings and frame. The closing magnets require a total

of approximately 80 amp and the tripping magnet 2.2 amp at 110 volts.

This oil switch was manufactured by the Condit Electrical Manufacturing Company, Boston, Mass., and was installed under the direction of Lockwood, Green & Company, architects and engineers, Boston, Mass.

Drive Anchor

A three-piece drive anchor is being manufactured by the Universal Cable Grip Company, Syracuse, N. Y. The device consists of a slug, a guy rod and a thimble. The guy rod is upset at the upper end for withstanding the strain of pounding and hammering, and a forged



FIGS. 1 AND 2—DRIVE ANCHOR IN POSITION FOR DRIVING AND WITH SLUG HORIZONTAL

shoulder at the other end eliminates the need of threads or holes.

The slug, as shown in the illustration, has one end pointed and the other curved end flattened out. When being driven into the ground the slug takes the position shown in Fig. 1, and when being pulled out that in Fig. 2. A toggle joint which engages the forged shoulder of the rod enables the slug to turn from the upright position to one at right angles to the rod. When in a driving position the lower end of the rod fits in a step at the base of the pointed part of the slug, thus transmitting the full force of the blow at the upper end of the rod directly to the point and also holding the slug in a rigid upright position until the anchor is driven to the required depth. A slight upward lift on the rod disengages the end from its step. The forged shoulder works in a slot in the slug, and on account of the resistance to an upward pull caused by the fluke of the anchor the slug turns to a horizontal position. The slug can turn no further since the toggle-joint slot is so designed that it is held in this position.

Arc Welding

Arc welding is receiving considerable attention at the present time from railways and industrial concerns. It is particularly well adapted for use in machine shops and foundries. Worn parts of machines, for instance, can be built up prior to machining, broken parts of steel castings can be welded together, and often defects developing in new castings after considerable machining has been done can be obliterated by means of the electric arc. In steam-locomotive and electric-railway shops, steel mills, etc., numerous other applications can be made.

In Fig. 1 is shown a motor-generator set used for arc welding. The equipment is built in four different sizes, rated at 200 amp, 300 amp, 500 amp and 800 amp respectively. The generator is a 75-volt commutating-pole machine and can be operated either by belt or by motor drive. The instrument and control panels are made up of two sections. The upper section contains

FIG. 2—ARC WELD ON BACK FLUE SHEET OF LOCOMOTIVE

the indicating instruments, protective apparatus and switches for regulating the welding current, and the lower the starting and protective equipment for the motor-generator set. It is often desired to have several welding circuits connected to one generator, and when this is the case a control panel is provided for each circuit. Metal or carbon welding can be done from any of these panels independently of the others, and one arc can be used, or more than one simultaneously.

The accessories furnished with this welding outfit consist of a carbon holder, a hood for protecting the operator, a shield and a metal-pencil holder for each welding circuit. This arc-welding equipment has been developed by the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa.

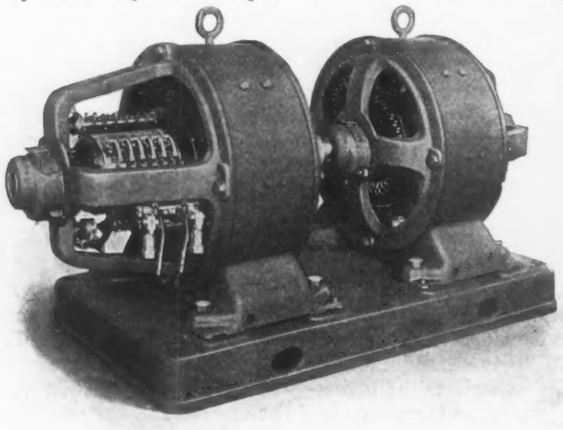


FIG. 1—MOTOR-GENERATOR SET FOR ARC WELDING

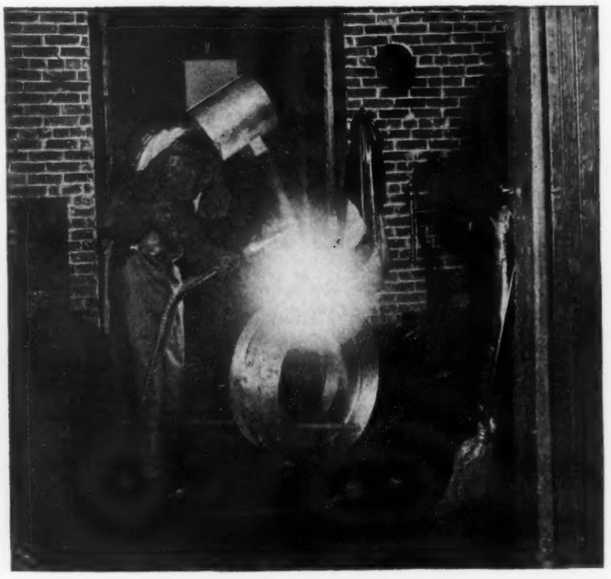
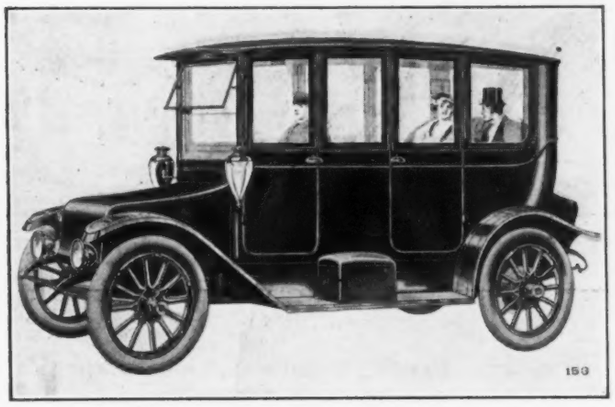


FIG. 3—VIEW OF AN OPERATOR MAKING A WELD

Electric Limousine

The electric limousine illustrated herewith is being manufactured by the Anderson Electric Car Company, Detroit, Mich., and is known as the "Detroit." In the rear compartment three persons can be accommodated on the rear seat and two more on auxiliary seats. Two



SEVEN-PASSENGER ELECTRIC LIMOUSINE

persons including the driver can be seated in the front compartment. The wheelbase of this car measures 112 in. and the tread 56 in. The battery is made up of 60 A-6 Edison cells. The car may be operated at speeds of 5, 8, 13, 17 and 20 miles per hour. The mileage on one charge ranges from 50 to 75. Wheel steer is used and the car is controlled by means of a lever on the steering wheel. The width of the rear seat, top of cushion, is 47 in. and the depth is 20 in. The two auxiliary seats are of the folding type and are 14 in. by 14 in. The driver's seat is 43 in. wide and 22 in. deep. The width of each of the two rear doors and of the two front doors also is 22 in.

50-Hp Oil Engine

Several changes have recently been made in an oil engine described in the *Electrical World* of June 29, 1912. All of the bearings are oiled automatically by means of a Detroit forced-feed mechanical oiler. When the engine stops the flow of oil also stops. The outboard bearings are equipped with renewable phosphor-bronze bushings and are oiled by rings. The governor gives a regulation of less than 2 per cent from no load to one and one-quarter load. This governor is equipped with a recoil clutch, shown in Fig. 2, which absorbs the shock caused by the explosion in the engine. The piston is fitted with six rings instead of four as formerly. The piston is made with a convex head, thus centralizing the force of the explosion and avoiding severe strains in the cylinder walls. The design of the taper wrist pin has been changed so as to provide for larger wearing surface. An improved spray, the manufacturers claim, atomizes the oil and delivers it into the vaporizer in such condition that not a trace of carbon is left in the vaporizer or vaporizer cap when using

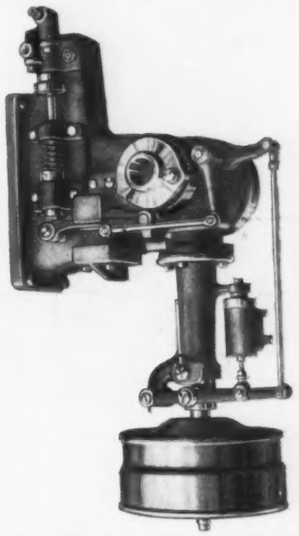


FIG. 2—MECHANISM SHOWING RECOIL CLUTCH

34-deg. distillate fuel oil. About 130 gal. of cooling water is required per hour. The engine is built by the Covington Machine Company, Covington, Va.

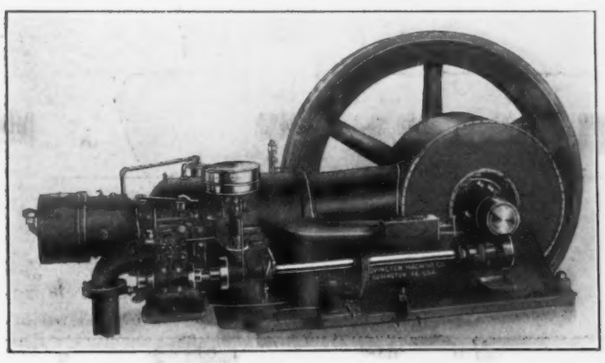
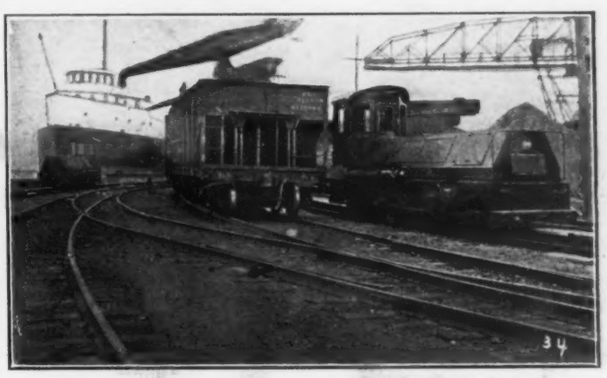


FIG. 1—50-HP OIL ENGINE

Electric Locomotive

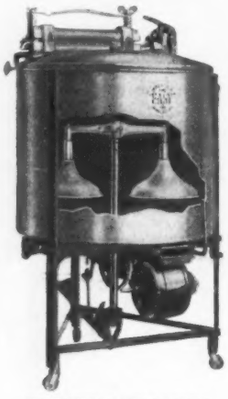
Three locomotives of unusual design have recently been built for the Pennsylvania Railroad to handle cars at its Cleveland ore docks. The most unusual feature in connection with these locomotives is that they do not run on the same tracks as the cars they handle but on narrow-gage parallel tracks, which are 42 in. wide. They are not attached to the cars by couplings, but each locomotive is equipped with an arm on each side which can be lowered by means of compressed air controlled from the cab. This arm acts as a pusher, as shown in the illustration. Single cars or trains can be handled and cars can be shifted and cut out from trains with little trouble. These locomotives are of the Baldwin-Westinghouse make and weigh 25 tons each. The motors are of the Westinghouse commutating-pole type. Energy is obtained from two rails lying inside the rails on which the locomotives operate. These rails are protected by a wood covering.



ELECTRIC LOCOMOTIVE WITH SIDE-ARM PUSHER

Electric Washing Machine

The electric washing machine illustrated below cleanses the clothes by air pressure and suction instead of by friction. The machine is provided with two suction basins which work up and down, forcing the water



ELECTRIC WASHER

through the clothes and sucking it back again. Every time they reach their uppermost position these basins turn automatically to a new position on the downward movement. This operation produces a strong agitation of the water through the clothing without subjecting the clothing to the deleterious effects of rubbing. The tub is made of cold-rolled copper, the walls of which are securely double-seamed and soldered to the bottom. The tub is 24 in. in diameter and 18.5 in. deep. The machine is operated by a ⅛-hp motor, which is attached to the supporting plate by two thumbscrews, making it easily detachable for operating other machinery if desired. By pulling a lever the motor is shifted from the washer to the ringer and the speed of the motor is reduced. Instant reverse of the wringer is secured by means of a small lever conveniently located near the end of the upper roll.

This electric washing machine is built by Messrs. Dodge & Zuill, Syracuse, N. Y., and is driven by a motor furnished by the Robbins & Myers Company, Springfield, Ohio.

Motor-Driven Combined Coal-Cutting and Loading Machine

In a combined coal-cutting and loading machine designed recently for operation by electricity, the essen-

FIG. 1—COMBINATION MINING AND LOADING MACHINE IN OPERATION

tial parts are an under-cutting chain, two vertical sheering chains, a pick, a stationary frame, or pan, on which the cutter head can be fed forward or backward, a receiving conveyor and separate loaders for lump and slack coal. The apparatus, which operates similarly to a breast machine, can be placed in the working space of the mine and need not be removed until the coal is all worked out. Entries, rooms or break-throughs of any desired width can be cut with this combination machine. Cutting, feeding and loading operations are performed

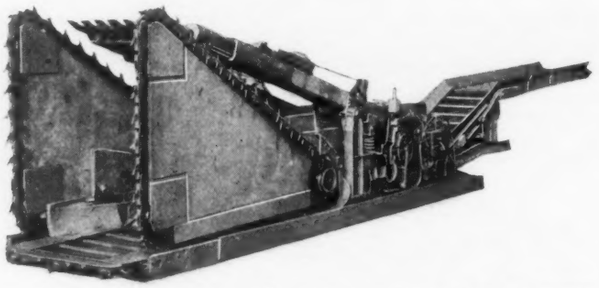


FIG. 2—ELECTRICALLY OPERATED MINING AND LOADING MACHINE

by a motor and are controlled from levers on the side of the apparatus. The particular machine illustrated herewith is capable of mining and loading 100 tons in about eight hours. It is built by the Jeffrey Manufacturing Company, Columbus, Ohio.

Reciprocating Electric Washer

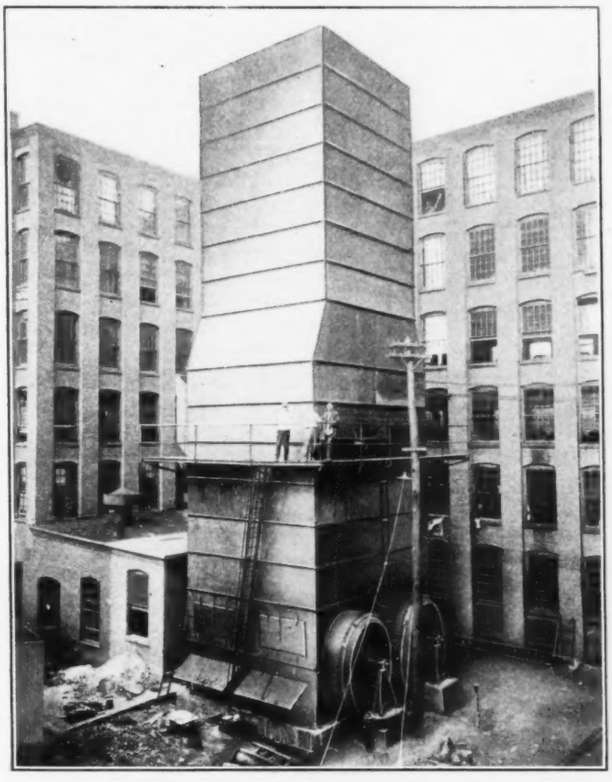
Changes have recently been made in the reciprocating electric washing machines manufactured by the Judd Laundry Machine Company, People's Gas Building, Chicago. The wooden and fiber tub ends have been eliminated, and the entire receptacle for clothes is now made of heavy copper, thus making the interior of the tub smooth and free from projections. Formerly a single spring was used on the driving mechanism, but now the original spring has been made longer and another spring has been added. A pair of wooden rolls has been placed 1.5 in. in front of the rubber wringer rolls to add to the safety of the operator. A permanent discharge connection has also been added, and the driving gears and driving mechanism have been made

RECIPROCATING ELECTRIC WASHER

heavier. The manufacturers claim that the reciprocating motion of the tub imparts impetus to the water. The improved machine is shown in the accompanying illustration.

Cooling Tower

A large twin forced-draft cooling tower which was installed by the Wheeler Condenser & Engineering Company, Carteret, N. J., at New Britain, Conn., for the American Hardware Company, is shown in the accompanying illustration. The equipment is designed to cool 132,000 gal. water per hour from 100 deg. Fahr. to 80 deg. Fahr. The tower proper terminates just above the platform on which the men are standing, as shown in the illustration, the steel-plate work above consisting of a stack to convey the vapors above the roof of the building and also to provide natural draft for operation in cold weather. The tower is built with special air inlets which are opened when the fans are not in use. The stack supplies the draft. The inlets are closed by counterweighted doors. The equipment

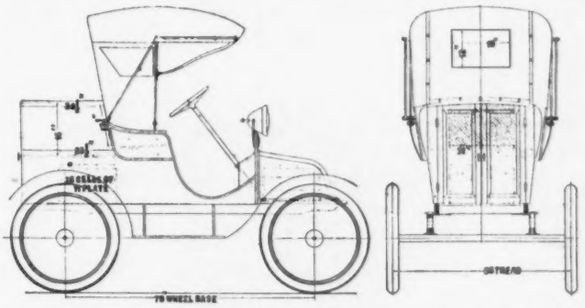


TWIN FORCED-DRAFT COOLING TOWER INSTALLED AT NEW BRITAIN, CONN.

consists of two towers side by side, each 11.5 ft. wide and 18.25 ft. long, erected over a reservoir. The chimney is 18.25 ft. square and the height from the base of the tower to the top of the stack is 70 ft. Forced draft is supplied by four 108-in. fans.

Light-Weight Meter Wagon

To satisfy the demand for electric vehicles especially adapted to the needs of electric service companies for meter work, lamp trimming and light deliveries, the Buffalo Electric Vehicle Company, Buffalo, N. Y., has designed and put on the market several light-weight electric wagons. The same chassis is used for the different types. The speed of these wagons is from 16 miles to 18 miles per hour. In the vehicle shown herewith the loading space is in the rear of the seat. Folding doors opening at the rear give access to the loading compartment and to the battery. The space above the battery is 16 in. high by 24.5 in. wide by 31 in. long, and the space to the rear of the battery is 10 in. by 14 in. by 31 in. A carbon box is placed on the dash-



LIGHT-WEIGHT VEHICLE SUITABLE FOR LAMP-TRIMMING OR METER WAGON

board. The driver's seat is upholstered in leather. The hood over the seat is provided with front storm curtain and side curtains.

Porcelain-Clad Transformer for Operating Bells and Buzzers

A small porcelain-clad transformer suitable for residence doorbells, buzzers and various kinds of light signal work is shown in the accompanying illustration. The porcelain may be white, brown or blue. The core is of silicon steel and the coils are form-wound and vacuum-treated. The entire case is filled with insulating compound. The transformer is wound to operate with alternating current at pressures ranging from 100 volts to 130 volts. The length of the device is 3.25

PORCELAIN-CLAD TRANSFORMER FOR DOORBELLS AND SIMILAR LIGHT SIGNAL WORK

in., the width 3 in., the height 3.5 in. and the weight 1.75 lb.

The transformer described above is being placed on the market by the Packard Electric Company, Warren, Ohio.

Jobber, Dealer and Contractor

Semi-Annual Convention of the Iowa Electrical Contractors' Association

Lively interest marked the papers and discussions on accounting, modern business methods, compensation insurance and co-operation with central stations at the second semi-annual meeting of the Iowa Electrical Contractors' Association, Cedar Rapids, April 22 to 23. In a paper, "Modern Business Methods in Electrical Contracting," by Mr. Edward Kunkel, of Davenport, Ia., the idea of exercising friendly co-operation instead of vindictive enmity and distrust was pressed home forcibly. Among the ideas emphasized were the value of good service and high quality as against cheap prices and inferior work, the keeping of accurate records and the possession of a well-planned organization instead of one that is haphazard and wasteful, the necessity of thoughtful planning and of honest business ethics in place of cunning and sharp practices, kind and considerate but firm handling of employees, and honest effort with legitimate profit. The speaker said an intelligent and consistent advertising scheme, prompt and accurate estimating methods, concise and definite closing of contracts and other business, careful and systematic handling of work after it has been secured, a well-arranged stockroom and a systematic plan for checking its contents, tastefully arranged salesroom for retail supplies, appliances and fixtures, and prompt and insistent collection of accounts were all important to the modern electrical contractor.

Inasmuch as the Iowa workmen's compensation law goes into effect July 1, the question of insurance was of keen interest among the contractors. Mr. George O'May, of Sioux City, gave a brief talk at the first session of the convention covering the cost of insurance to contractors. Following a few questions on the subject of insurance, Mr. C. E. Browne, of the American Electric Supply Company, of Chicago, outlined a record-keeping and cost-accounting system applicable to the contractors' business. "Watch each piece of material no matter how small" was the keynote of the talk.

Mr. J. W. Parry, of the engineering extension department of the Iowa State College, spoke on the possibility of the department increasing its scope to help the contractors by training their men to be more efficient in doing work and handling business.

Use of Old-Code Wire in Iowa

In spite of the fact that the Underwriters' Laboratories inspected and labeled about 1,000,000,000 ft. of rubber-covered copper wire, including flexible cord and fixture wire, during 1913, the use of old-code wire is still somewhat prevalent in the State of Iowa, according to the statements of Mr. J. E. Latta, who, as representative of the Underwriters' Laboratories, has been making investigations. The so-called old-code wire is insulated with a product made from an asphalt base, and this composition when it has dried rapidly loses its insulating properties. Wire made according to the 1913 code specifications carries enough rubber in the insulation to make it a durable and safe product.

Facts concerning wire were pointed out by Mr. Latta before the contractors' convention and also before the Iowa State Section of the National Electric Light Association. The Iowa Electrical Contractors' Association in executive session passed a resolution pledging the members to discourage the use of old-code wire and use none but new-code wire and approved fittings.

On Wednesday afternoon there was a joint session with the Iowa State Section of the N. E. L. A.

In a talk at the Thursday morning's session Mr. Israel Lovett, of Council Bluffs, told of his methods of handling workmen. To secure efficiency, said the speaker, it is necessary to get the men properly and promptly started on the job and watch the progress of the work. It is the business of the contractor to think for his men, laying out their work so that they will proceed along lines producing economic results. Following this talk a further discussion on compensation insurance ensued, occupying the greater part of the forenoon.

Contractors Forego Pleasure for Business

Foregoing the pleasure of a trolley trip to Iowa City, the contractors held a business session Thursday afternoon and also listened to a paper, "System of Bookkeeping for Electrical Contractors," by Mr. W. J. Ball, of Moline, Ill. Mr. Ball told of the importance of "turning over" stock and not keeping on the shelves material for which there was little or no call. Money invested in such stock can better be kept in a bank, where it will draw at least 3 per cent interest. The practice of separating accounts was also taken up, the speaker pointing out that each branch of the business should be self-supporting, and that if it is not the contractor should know it. Just what branches of a business are the producers can be known only by keeping proper accounts. Mr. Ball brought out the value of the inventory by showing how important such data would be in case the store of a contractor was destroyed by fire. An up-to-date inventory is also a convincing argument if presented to a banker when a contractor wishes to borrow money. The value of co-operation was emphasized, the speaker claiming that no one can climb to the pinnacle of business success over the necks of his competitors.

There was no election of officers, as those now serving were elected last February. Mr. M. A. McCarten, of Marshalltown, is president, and Mr. M. T. Humphrey, of Waterloo, is secretary of the contractors' association. It is probable that the next meeting of the association will be held in the western part of the State so that the following spring meeting can convene in Keokuk simultaneously with that of the Iowa State Section of the N. E. L. A.

Results of Co-operative Wiring Campaign at Toledo, Ohio

Working together, the wiring contractors and the electric-service company at Toledo, Ohio, have succeeded in wiring 600 houses during the last four months. Perhaps the most remarkable thing about this record is the fact that all of the houses are on streets where lighting lines existed. When the Toledo property was taken over by the Doherty Operating Company a canvass showed that a very low percentage of the available houses were wired; hence the making of extensions was postponed until the present lines should reach a more saturated condition. Even now, in the fifth month of the campaign, the electric-service company's solicitors are turning in signed lighting contracts at the rate of twenty-five a week, so it will be seen that the wiring business continues to flourish.

According to the terms of the contract under which this business is solicited prospective customers pay the contractor 25 per cent of the total wiring bill when the application is accepted and pay 10 per cent of the remainder on the first of each month at the office of the electric-service company. The contractor receives the full amount of the bill at the completion of the work, collecting the additional 75 per cent of the bill from the

lighting company. The accompanying table, which is part of the contract, gives the prices of wiring houses having from five to sixty outlets. Fixtures are not included in this contract, and although the central-station's solicitors carry a booklet showing a simple set of lighting units, customers are generally encouraged to install better fixtures, as it has been found that better

HOUSE-WIRING SCHEDULE, TOLEDO, OHIO.

No. of Outlets	Single Flooring	No. of Outlets	Single Flooring	No. of Outlets	Single Flooring	No. of Outlets	Single Flooring
5	$15.85	19	$38.45	33	$58.05	47	$79.81
6	17.85	20	39.85	34	59.45	48	81.45
7	19.85	21	41.25	35	60.85	49	83.09
8	21.85	22	42.65	36	62.25	50	84.73
9	23.85	23	44.05	37	63.65	51	86.37
10	25.85	24	45.45	38	65.05	52	88.01
11	27.25	25	46.85	39	66.69	53	89.65
12	28.65	26	48.25	40	68.33	54	91.29
13	30.05	27	49.65	41	69.97	55	92.93
14	31.45	28	51.05	42	71.61	56	94.57
15	32.85	29	52.45	43	73.25	57	96.21
16	34.25	30	53.85	44	74.89	58	97.85
17	35.65	31	55.25	45	76.53	59	99.49
18	37.05	32	56.65	46	78.17	60	101.13

satisfaction will result if a higher grade is selected in the first place at the completion of wiring.

The status of each wiring job is kept before the assistant new-business manager, Mr. C. H. Felker, by means of addressed postal cards mailed from the offices of contractors and fixture men when they have completed their part of the work.

Business Methods in a Modern Electrical Jobbing and Retail Establishment

Customers patronizing electrical stores like personal attention from members of the firm, and for this reason in the store of the Avery-Loeb Company, Columbus, Ohio, the desks of Mr. Oscar Avery, president, and Mr. A. E. Loeb, vice-president, have been placed well toward the front of their main store on Third Street. Instilling this spirit of courtesy and personal service into the six men representing the sales force of the company, says Mr. Loeb, has been responsible for doubling the incandescent-lamp business of the company annually. The sales force consists of two sales-

FIG. 1—INTERIOR OF ELECTRICAL STORE, COLUMBUS

men who travel in the territory adjacent to Columbus within a radius of 75 miles, two city salesmen, one handling construction work and the other merchandise sales, and two men in the main retail store. To aid in handling the sales of supplies in the adjacent territory branch stores have been established at Mount Vernon and at Newark.

As a means of fostering the spirit of co-operation and loyalty, sales meetings are held on every second Monday night, some meetings being devoted to discussion of problems brought up by the various heads of departments, while at other times representatives of electrical manufacturing establishments are invited to talk before the employees. Alternating with the sales meetings the

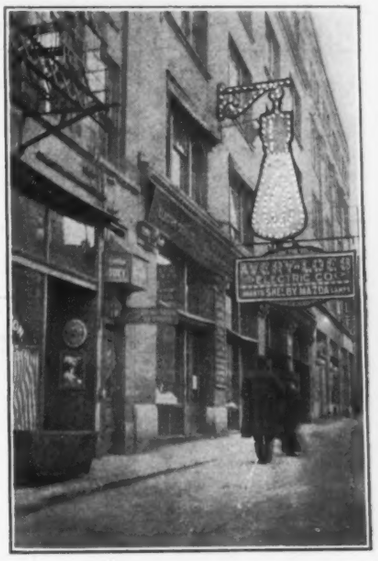


FIG. 2—SIGN OF COLUMBUS JOBBING HOUSE

construction men also get together on Monday nights. Their meetings are largely educational, the lessons being along the line of record keeping and shop management. Average attendance for both sales and construction men is estimated at 98 per cent.

Practically all of the main floor of the building, occupying a space 35 ft. by 70 ft., is given over to retail business. The front room of this floor is shown in Fig. 1. Wiring devices and supplies of each manufacturer are mounted on display boards hung just back of the counter. In the row of shelves behind each one of these displays, broken packages of the goods of the respective manufacturer are kept. For demonstrating the relative illuminating value of the various sizes of lamps, a circuit has been arranged above the counter within easy reach of both the customer and the salesmen. Above the counter at the right of the illustration common types of reflectors have been installed in a like manner to help the customer to his choice. In the rear of the broken-package shelves are the headquarters of a shipping department and the wiremen. Small coils of wire and broken lots of lamps are stored on a mezzanine floor. On this mezzanine floor is also the desk of a special vacuum-cleaner salesman, who has his headquarters in the store of the company but operates on a commission basis. The company's shops are in the basement.

On the second floor are the offices of Mr. C. W. Hammond, secretary and treasurer, together with those of the bookkeepers, cashier and stenographers and the filing room. The conference room in which employees' meetings are held adjoins this suite of offices on the rear. At one end of the building is a stockroom.

Being within a few doors of the contract department of the Columbus Railway & Light Company, the busiest days for the Avery-Loeb Company generally fall between the sixth and tenth, when customers paying their electric-light bills purchase lamps. The electric sign shown outside the building contains 500 2.5-watt lamps and was the first electric sign to be purchased by an electric jobbing house in Columbus.

Industrial and Financial News

Public Utility, Commercial, Corporate and Trade Developments—The Electrical Material and Security Markets

Specialty Manufacturer Sees Improvement Ahead.—The Fahnestock Electric Company, of Brooklyn, N. Y., is finding the demand for its product of spring connector clips rather dull at present, but conditions give some promise of improvement. This company is not now working on any new devices.

A State Prison Takes Electric Service.—By the terms of a contract between the Consumers' Power Company, of Stillwater, Minn., and the Minnesota State Prison at that place, the latter is served with the excess energy developed at the Apple River hydroelectric plants. When operating at full capacity the state prison, with its shops, requires 1500 kw of electrical energy.

Removal of H. M. Byllesby & Company.—The removal of the general office of H. M. Byllesby & Company in Chicago was effected on April 18. The new location is on the nineteenth floor of the new Continental & Commercial Bank Building, at the southwest corner of South LaSalle and West Adams Streets. The new offices take up about one-half of an entire floor of the large building.

Lamp Business Dull.—The Bryan-Marsh Electrical Works of the General Electric Company are finding business slow at this time. The recent reduction in prices of tungsten-filament lamps has made hardly any noticeable difference in the lamp situation, at least as far as the territory around New York is concerned, but it is expected to help in driving the carbon-filament lamps out of extensive use.

Instrument Maker Adds to Factory Facilities.—Owing to the increased demand for its product of electrical testing instruments, the Thompson Levering Company, of Philadelphia, Pa., has been forced to make an addition to its factory facilities. This change gives the factory about double its former capacity. The company has found its business so far in 1914 larger than in the corresponding period of last year.

General Motors Truck Sales Progressing.—The recent sales of electric trucks by the General Motors Truck Company, of Pontiac, Mich., have included ten cars to the Loose-Wiles Biscuit Company, six trucks to the Merchants' Auto Delivery Company, of Galesburg, Ill., and an electric flushing machine to the city of Birmingham, Ala. The latter car consists of a water tank and pressure sprinkler, which has a larger capacity and wider range than the usual form of horse-drawn gravity sprinkling cart.

Sealing Compound Approved by Underwriters.—What is described by the manufacturer as an insulating wax and sealing composition has just been examined and approved by the National Board of Fire Underwriters. Fred M. Williams, of 16 Wellington Court, Brooklyn, N. Y., is the maker, and he states with regard to this product that it is made in four colors, red, brown, white and black, and is used for sealing in screws and current-carrying parts in switches, sockets and other electrical fittings. He has sold many tons of the material during the two years that he has been making it.

Automatic Control for Lamps in Large Detroit Hotel.—In the August 30, 1913, issue of the *Electrical World* a note appeared on the automatic door-bolt solenoid switch perfected by the Hart Manufacturing Company, of Hartford, Conn., for use in controlling the lamps in hotel guest rooms, a device which insures the lamps burning when necessary and being out of circuit at other times. It has just been learned that this type of switch has been specified for the new Statler Hotel, in Detroit, Mich., and the manufacturers consider this as a special indorsement, as the switch was tried out in the Statler Hotel in Cleveland, Ohio, owned by the same interests.

Exporter of Electrical Supplies Deplores Dull Conditions.—A representative of the Federal Electric Company, of 141 Broadway, New York, stated in an interview during the past week that the export business in electrical supplies is very dull. To quote him exactly, his company is "still paying the rent," but he could give nothing more cheerful than that. Questioned as to the outlook, he said that there are no signs of any change either for the better or worse, and that this characterizes the export business in the line handled by his company.

New Plant to Be Constructed for Electrical Manufacturer.—The Bodine Electric Company, Inc., of 564 West Randolph Street, Chicago, Ill., is planning to build within the coming year a new manufacturing plant with a floor area of 30,000 sq. ft. This company was recently organized to take over the copartnership business established in 1905 by C. D. Bodine and P. J. Bodine. It plans to carry on this business on a much larger scale than under the old system. Its present line consists of small tool-drive, generators and special electrical apparatus, and it is now developing a line of fractional horse-power single-phase motors which will be ready for the market at an early date. The officers of the new corporation are C. D. Bodine, president; J. P. Bodine, vice-president, and P. J. Bodine, secretary and treasurer.

Large Order Placed for Ornamental Lighting Standards.—From W. L. Fairchild, of the Union Metal Manufacturing Company, 110 West Fortieth Street, New York, information comes of the placing of a large order for ornamental lighting standards by the Syracuse Lighting Company, of Syracuse, N. Y. This order is for No. 5 standards and is the second order for 500 poles placed by this company with the above manufacturer within a short time. The Union company recently secured contracts for supplying a number of poles for the special lighting at the Panama-Pacific Exposition, and it is now very busy. Mr. Fairchild stated that there is an increasing demand for poles with a low-pedestal design and that lantern-style globes are being specified to a growing extent. He sees a gradual tendency toward the single lamp unit in place of the usual cluster design, but this will probably not be a ruling factor for some time.

Booming Industrial Applications.—The Bristol (Tenn.) Gas & Electric Company is making use of an interesting and novel method of popularizing electricity among the manufacturers, as well as the general public in its territory. The plan of this company is to give a series of industrial displays in the front windows of its office building on State Street. Here every manufacturer in the vicinity is entitled to one week in which to display in one window his finished product and in the other window a part of the manufacturing process. These displays have been in progress for six weeks and have proved valuable to the company and the exhibitors and most interesting to the public. The window space and the electric light and motor drive required for these displays are furnished free to the exhibitors, and the display, besides covering the particular product and process which may be occupying the window at any special time, furnishes a continual exhibit of the application of electricity to these processes.

Wire Manufacturer Finds Present Conditions Satisfactory.—During February of this year the capacity of the Pennington (N. J.) mills of the Peerless Insulated Wire & Cable Company, 18 Broadway, New York, was increased by about 40 per cent, and the company's present business is good. It finds satisfactory conditions obtaining in its raw-material markets. The product of this concern, it is claimed, occupies a middle ground between the ordinary grades of weatherproof wire and the rubber-insulated wire already on the market. In the manufacture of weatherproof wire

the bare wire is coated with insulating compound, then a thick covering of unspun cotton is wrapped spirally around the wire, and this cotton is impregnated with the insulating compound. The whole is then finally covered with a single braid. One of the strongest claims made for this insulation is that many hours' soaking in water will not penetrate its shell, and it offers a high resistance to abrasion, besides being tough and flexible. It is used largely in outdoor work, and one of the largest individual purchasers of this product is the Postal Telegraph Company.

Western Electric Company to Market Conlon Washing Machine.—An alliance has been formed between the Conlon Electric Washer Company, of Chicago, and the Western Electric Company. Under the arrangements the entire line of the well-known Conlon electric washing machines will be marketed exclusively by the Western Electric Company under the trade name of the "Western Electric Conlon." This selling arrangement involves no changes in the manufactory. Ample stocks will be carried at each of the twenty-eight Western Electric distributing houses at shipping centers throughout the United States. The Western Electric Company is planning a sales campaign, a feature of which will be a complete merchandising plan which will enable the central stations and electrical dealers to push the sale of the machine aggressively.

Building Government Wireless Towers at the Isthmus.—The contract for erecting three steel towers for wireless-telegraph purposes in the Panama Canal Zone has been let to the Childers Construction Company, of Columbus, Ohio. J. L. Childers, one of the company's engineers, sailed recently for Panama to start the preliminary work. The steel is being fabricated at Toledo, Ohio, and part of it is ready for shipment. Each of the towers will be 600 ft. high, with a 150-ft. triangular base tapering to a 10-ft. triangle at the top. These towers will be planted about 90 ft. apart and close to the site of the Gatun Locks and will require a total of 1000 tons of steel. The work is expected to cover a period of about five months. J. L. Childers and his brother, W. B. Childers, who is associated with him, were both prominently connected with the building of the Gatun gates as engineers with the McClintic-Marshall Company, of Pittsburgh.

Conditions as a Wire Manufacturer Sees Them.—The Belden Manufacturing Company, of Chicago, Ill., manufactures a line of insulated wire and insulation for various electrical uses. Joseph C. Belden, the president of the company, speaking on conditions in the insulated-wire field, as well as of business in general, says the company's raw materials consist of copper wire, cotton, silk and rubber, and it finds present conditions in these markets satisfactory, prices having been reasonably stable for some time. Labor conditions are also fairly good. Mr. Belden states that he usually has to hire four people to fill two positions, but that there is plenty of work for all of fair ability who want to work. This company finds transportation conditions generally good, except that the railroads will, as a rule, evade all just claims until forced to settle. The parcel post has been found very useful. The rapid growth in the automobile industry has vastly increased the demand for the Belden company's goods.

Electrical Appliance Manufacturer on Present Conditions.—Some interesting information on electrical manufacturing conditions in the Middle West is given by J. A. Winger, of the Automatic Electric Washer Company, Newton, Ia. This company finds its raw-material markets in a satisfactory state, and it is able to buy at reasonable prices and in desired quantities, while deliveries are prompt. No trouble is experienced in obtaining intelligent labor. There are no labor unions and no labor troubles. Day wages are paid, and Mr. Winger states that this system of remuneration has produced more satisfactory results than the piece-work plan, which has been tried by some other manufacturers in the same vicinity. The nature of its work has not been such as to necessitate special training of its men by this concern. The product of this company is most largely used in the Central and Western States, although there is no reason as far as the management knows why this should be so. Proceeding on the supposition that it may be due to lack of information in the East on the product in question, the company has been advertising in Eastern papers, and this is stated by Mr. Winger to have somewhat increased its distribution in that territory. Concerning transportation conditions, the present railroad service is found by this company to be fairly satisfactory and shipments are generally handled quite promptly. The parcel-post service is used largely by this company and is proving very valuable. While professing uncertainty as to the merits of the recent request for an increase in freight rates, this company thinks that the delay in settling the question one way or the other is hurting business. It also thinks that the public can stand a 5 per cent increase in rates better than it can a 20 per cent decrease in business.

Sale of Electrical Apparatus to Industrial Companies.—Among recent sales of electrical apparatus by the General Electric Company, some of the larger orders have been secured from companies in different lines of manufacturing. The fact that these companies are widely scattered geographically, as well as in the variety of their product, seems to indicate that there is some activity in the industrial field, in spite of the general dullness now prevailing. The American Cement Plaster Company, Fort Dodge, Ia., will install electric-drive equipment, comprising thirty-four motors, ranging in size from 7½ hp to 75 hp, with switches and auxiliaries. Electric-drive equipment, consisting of thirty motors of from 1-hp to 35-hp rating, is to be installed in the Duluth (Minn.) plant of the Western Rug Company. An order for forty motors, ranging from fractional up to 125 hp, together with switchboard and accessories, has been placed by the American Bottle Company, of Streator, Ill. From the California Portland Cement Company, Colton, Cal., an order has been received for electric-drive equipment, consisting of thirty-five motors from 10 hp to 50 hp, and for a 25-kw motor-generator set, with relay panels, switches and other auxiliaries. The Power & Mining Machinery Company, Cudahy, Wis., is shortly to install thirty-three motors ranging from ⅜ hp to 150 hp. Three 1250-hp, two 1000-hp, one 300-hp, one 100-hp, and two 50-hp induction motors have been ordered by the St. Lawrence River Power Company for installation in its aluminum plant at Massena, N. Y. The drive equipment of the Crestmore (Cal.) plant of the Riverside Portland Cement Company is to be extended by the addition of nine motors of ratings between 10 hp and 200 hp, recently ordered, together with a complement of transformers and switches. The Ottawa Silica Company, Ottawa, Ill., has ordered six motors of from 35 hp to 100 hp, together with a 50-kw motor-generator set and auxiliaries. Thirty-eight 30-hp induction motors are to be placed in the Bedford (Ind.) plant of the Indiana Quarries Company in the near future. From the Iowa Portland Cement Company, Des Moines, Ia., an order has been received for a 160-kw motor-generator set and a 165-hp induction motor with switchboard and accessories. A 400-hp induction motor has been ordered by the State Phosphate Company, of Alafia, Fla. In the Whipanny (N. J.) plant of the Hanover Brick Company there are to be installed fourteen motors of ratings between 3 hp and 75 hp.

NEW YORK METAL MARKET PRICES

	Apl. 21		Apl. 28	
Copper	Bid	Asked	Bid	Asked
Standard spot*	13.40	14.00	13.37½	14.00
	Selling Prices		Selling Prices	
	£ s d		£ s d	
London, standard spot*	64 6 3		63 15 0	
Prime Lake	14.50	to 14.75	14.37½	to 14.62½
Electrolytic	14.20	to 14.30	14.10	to 14.20
Casting	14.05	to 14.15	14.00	to 14.10
Copper wire base	15.50	to 15.75	15.25	.....
Lead	3.80		3.90	
Nickel	40.00	to 45.00	40.00	to 45.00
Sheet zinc, f.o.b. smelter	7.00		7.00	
Spelter, spot	5.15	to 5.25	5.00	to 5.10
Tin, spot	35.45	to 35.65	34.37½	to 34.62½
Aluminum:				
Prompt delivery	18.00	to 18.25	17.75	to 18.00
Future	17.87½	to 18.12½	17.75	to 18.00

*OLD METALS

Heavy copper and wire	13.25	13.25
Brass, heavy	8.62½	8.62½
Brass, light	7.62½	7.62½
Lead, heavy	3.80	3.90
Zinc, scrap	4.15	4.15

*COPPER EXPORTS

Total tons to Apl. 28	28,901

*From daily transactions on the New York Metal Exchange.

Corporate and Financial

Decision Reached on American Water-Works Voting Trustees.—The reorganization committee of the American Water Works and Guarantee Company has selected to act as voting trustees of the new American Water Works & Electric Company E. C. Converse, W. N. Cromwell, Howland Davis, Andrew Squire and A. H. Wiggin. These trustees will control the votes of the three classes of stock for a period of five years. Robert Wetherhill has agreed to serve on the board of directors of the new company.

Portland Railway, Light & Power Note Sale.—E. W. Clark & Company, of Philadelphia, Pa., have sold a five-million-dollar issue of one-year 5 per cent gold notes of the Portland Railway, Light & Power Company, the notes being dated May 1. Security for these notes has been provided by the deposit of $5,000,000 of the first mortgage, sinking-fund, thirty-year gold bonds of the Mount Hood Railway & Power Company, maturing in 1937, and of the entire capital stock (excepting directors' shares) of the same concern. The $25,000,000 capital stock of the Portland company is 75 per cent paid up, and the company is earning enough to pay dividends of 4 per cent on the full capitalization.

New Orleans Railway & Light Company Report.—The operating revenue of the New Orleans Railway & Light Company during the year ended Dec. 31, 1913, was $6,894,-432, an increase of 4 per cent over 1912. Of this amount $4,401,152 was received from the railway department, $1,335,186 from the electric department, and $1,158,094 from the gas department. The operating expenses were $3,600,-381, divided between the different departments as follows: Railway, $2,542,886; electric, $608,046; gas, $449,449. The net operating revenue was $3,294,051, an increase of 2.7 per cent. over 1912. Taxes were $724,535 and uncollectible consumers' accounts were $6,661, a total of $731,196. This left a net operating income of $2,562,855. Income from outside operations was $11,791, making a total operating income of $2,574,646. Miscellaneous income was $34,762. The gross income therefore was $2,609,408. Income deductions, including $23,375 for amortization of funded debt, discount and expense, were $1,731,879. This left a net income before deduction of dividends of $877,529, or after provision for dividends on a small amount of stock in affiliate companies owned by others, of $872,759. This is a decrease of 12.3 per cent. Hugh McCloskey, chairman of the board of directors, says in the annual report to stockholders that the decrease in net income, as compared with 1912, is due entirely to the increase in taxes. The board of taxation increased the assessment approximately $3,520,000, or 20 per cent. The increased cost of operation, due to increase in cost of materials and increased amount set aside to cover renewals and replacements, was $180,025. Charges for maintenance during the year amounted to $814,400, an increase of 4.1 per cent over the previous year. In addition, the company expended $225,230 for renewals and replacements, of which $180,812 was charged to operating expenses and $44,418 to depreciation reserve. Capital expenditures during the year amounted to $685,658. The company produced during the year 90,468,528 kw-hr.

Niagara Falls Power Company Report.—The combined income account of the Niagara Falls Power Company and the Canadian Niagara Power Company for the year ended Dec. 31, 1913, shows gross earnings of $2,742,192, an increase of $244,996 over the preceding year. Operating expenses, including $100,000 charged for obsolescence, inadequacy and as a reserve against extraordinary casualties, were $540,265, an increase of $75,167. They were equal to 19.7 per cent of gross earnings in 1913, as compared with 18.62 per cent in 1912. Net earnings were $2,201,927 last year and $2,032,099 in 1912. Other income, amounting to $116,058 in 1913, was composed of $77,153 interest and $38,905 dividends on stock owned. In 1912 the other income aggregated $148,564, of which $49,434 was interest and $99,130 was dividends on stock owned. The decrease is due to the discontinuance of dividends of the subsidiary, Cataract Power & Conduit Company and Tonawanda Power Company, following the order of the New York Public Service Commission, Second District, reducing power rates in Buffalo. Net income was $2,317,985 in 1913, as compared with $2,180,663 in 1912. Interest charges were the same in both years, $994,760. The other three items of charges show a slight decrease. Taxes were $194,162, as compared with $195,520. Insurance was $10,280, as compared with $10,561. Canadian Park rental was $48,673, as compared with $51,964. The total fixed charges, therefore, were $1,247,875, as compared with $1,252,805. The surplus income was $1,070,110, as compared with $927,858. Dividends of 8 per cent were paid on Niagara Falls Power Company stock. The combined balance sheet of the two companies as of Dec. 31, 1913 shows $886,220 reserve for accrued amortization of capital. Earnings of the subsidiary Cataract Power & Conduit Company for 1913 were $1,729,779; this, however, includes an item of $249,651, by which the total will be reduced if rates ordered by the New York Public Service Commission, effective from May 1, 1913, are finally upheld by the courts. Gross earnings of the Tonawanda Power Company in 1913 were $224,175, an increase of $14,140 over 1912.

Allis-Chalmers Annual Report.—The first annual report of the Allis-Chalmers Manufacturing Company shows the following items of income and expense for the fiscal period April 16 to Dec. 31, 1913: Sales billed, $11,127,621; cost, including depreciation and development expenditures, $9,-503,472; factory profit, $1,624,149; selling, publicity, administrative and general expenses, $1,017,553; net manufacturing profit, $606,596; interest on investments, bank balances and discounts, $148,528; net profit, $755,124. A statement to shareholders by Otto H. Falk, the president, says that at the close of the year, Dec. 31, 1913, the unfilled orders on hand amounted to $3,358,684. Mr. Falk said: "There has been a marked decline in volume of business each month since Aug. 1, 1913, in sympathy with a general recession of business throughout the country. The plants engaged in manufacturing operations are in good condition at present and of ample capacity to handle a much larger volume of business, and with the changes and economies that have been effected in the various departments throughout the organization there is every prospect, with the revival of business, that the Allis-Chalmers Manufacturing Company will earn substantial profits. During the fiscal period there has been invested in marketable securities the sum of $1,862,038, which, together with other securities previously acquired of $240,050, gives a total of $2,102,088. An agreement has been consummated whereby the preferred stock of the Bullock Electric Manufacturing Company is to be exchanged for first mortgage 6 per cent bonds of that company at the rate of $80 in bonds for $100 of preferred stock and the payment of the accrued and past due dividends on the preferred stock of the Bullock company to Jan. 1, 1914, amounting to 7½ per cent. After this exchange is completed the Allis-Chalmers Manufacturing Company, which now owns all the common stock, except directors' qualifying shares, will be the sole stockholder of the Bullock Electric Manufacturing Company. The Allis-Chalmers Manufacturing Company has agreed with the holders of the preferred stock to purchase at any time on or before Feb. 1, 1915, all or any part of such bonds as may be tendered at 95 per cent and accrued interest. The board of directors carefully considered the question of the declaration of a dividend on the preferred stock out of the surplus profits of $755,124, but in view of the present depressed conditions concluded to adopt the conservative policy and defer taking action thereon until such time as current profits and future prospects would justify a reasonable assurance of the continuance of dividend payments." In certifying to the report, Price, Waterhouse & Company say: "We have satisfied ourselves that the properties and assets acquired as of April 16, 1913, have been properly recorded on the books, and that during the period to Dec. 31, 1913, only expenditures on actual additions and extensions to the properties have been charged to capital account, and that, having regard to the amounts expended during the period for maintenance of plant and equipment, reasonable provision has been made for depreciation and accruing renewals. All expenditures incurred during the period on experimental and development work have been charged off as operating expenses and the item of deferred charges includes only advance payments pertaining to the operations of subsequent years. Adequate provision has been made for doubtful notes and for all ascertained liabilities."

Business Notes

The Busch-Sulzer Brothers Diesel Engine Company, of St. Louis, Mo., has appointed W. S. Heger as manager of its Pacific Coast sales division, with offices in the Rialto Building, San Francisco, Cal. H. S. Jones and W. S. Heger, Jr., will be associated with him in the sales promotion in this territory.

The Franklin Electric Manufacturing Company, of Hartford, Conn., has appointed Benjamin Hayllar, Jr., as manager of its Philadelphia office at 1625 Real Estate Trust Building. Mr. Hayllar, Jr., was formerly district manager of the Westinghouse Lamp Company in the territory including Philadelphia and Baltimore.

The Edward Darby & Sons Company, Inc., has recently announced the completion and starting of a new manufacturing plant at 412-20 North Eighteenth Street, Philadelphia, Pa. The old plant of this company was destroyed by fire in February and a special effort has been made to resume operations at the earliest possible moment.

F. H. Lovell & Company, of Arlington, N. J., manufacturers of electrical specialties, announce the election of F. H. Lovell, Jr., to the offices of president and treasurer, succeeding J. H. Callender, former president, treasurer and general manager. Mr. Lovell is also president and treasurer of the Lovell-McConnell Manufacturing Company, of Newark, N. J. Mr. A. D. Hobbie, vice-president of the latter concern, has been elected general manager of the first-mentioned. Both of the new officers have been connected with F. H. Lovell & Company in the past.

New Industrial Companies

The Electric Refining Company, of Quincy, Ill., has been incorporated with a capital stock of $5,000 to manufacture metal and wood material, etc. The incorporators are Robert W. Daniels, Robert M. Nivan and Frank T. McDermott.

The Utilities Equipment Company, of Boston, Mass., has been incorporated with a capital stock of $25,000 to manufacture water, gas and electric meters. The incorporators are C. W. Trask, president; Fred J. Parker, of Jamaica, treasurer, and P. N. Jenkins.

The Alpha Electric Company, of New York, N. Y., has been granted a charter with a capital stock of $25,000 to manufacture and deal in electrical apparatus and supplies. The incorporators are G. H. Makepeace, J. M. Ferry and P. J. Carbone, of New York, N. Y.

The Kelvin Electric Company, of New York, N. Y., has been incorporated with a capital stock of $25,000 to manufacture and deal in electrical machinery, apparatus and supplies. The incorporators are C. McMillan and K. Tikios, both of New York, and S. Popper, of the Bronx.

The F. B. Grant Electric Company, of Cleveland, Ohio, has been incorporated by F. B. Grant, M. L. Thomsen, H. B. McGraw, Frederick A. Henry and Vernon A. Davis. The company is capitalized at $10,000 and proposes to deal in all kinds of electrical supplies; also to do wiring and construction work.

The Line Material Company, of South Milwaukee, Wis., has annouced that L. E. Hendee, vice-president, has taken active charge of its sales department, while W. D. Kyle, general manager, who formerly had charge of this department, will now devote more of his time to investigation and development work, in connection with the line of street-lighting fixtures and line-construction material made by the company.

The Richmond Electric Works, Richmond, Va., manufacturers of alternating-current motors, who have for a number of years been represented in the Philadelphia territory by E. B. Day, have discontinued their agency with him and have opened up their own offices at 1418 Walnut Street, Philadelphia, to take care of Maryland, New Jersey, Delaware and eastern Pennsylvania. A large stock of Richmond motors will be carried in Philadelphia to facilitate prompt deliveries. L. F. Johnston has been placed in charge of the Philadelphia branch office.

Trade Publications

Electro-Chemical Apparatus.—The Arthur H. Thomas Company, of Philadelphia, Pa., has lately issued some folders descriptive of the Troemner analytical balance and the Northrup high-temperature electric furnace, both of which pieces of apparatus it handles.

Limit Switches.—Bulletin 1037 of the Electrical Controller & Manufacturing Company, of Cleveland, Ohio, describes the company's type B limit stops for direct-current motors. Dimensions and prices are given, together with a brief note on the design and operation.

Belt Dressing.—"How a Central Station Can Overcome Its Belt Troubles" is the name of the latest pamphlet put out by the Cling Surface Company, of New York. The answer advocated is "Use Cling Surface," and the booklet indicates that a number of central stations do so.

Lighting Fixtures.—The Beardslee Chandelier Manufacturing Company, Chicago, Ill., has recently added some attractive designs to its line of chandeliers for semi-indirect lighting. These are illustrated—a single design on a sheet—on some recent additions to its loose-leaf catalog.

Lighting Glassware.—A card illustrating its "Intaglio" glass for semi-indirect lighting service has just been sent out by the Gleason Tiebout Glass Company, of New York City. Another card refers to the use of its "Albedoglas" and "Camia" glassware in the new Lord & Taylor store in New York.

Sewing-Machine Motors.—The Emerson Electrical Manufacturing Company, St. Louis, Mo., has just issued a catalog on its direct-current and alternating-current motors for use in operating sewing machines. Facts of interest to possible purchasers of such equipment are contained in the booklet, along with prices on the same.

Guy Anchors.—Matthews guy anchors are illustrated and described in a folder recently issued by W. N. Matthews & Brother, St. Louis, Mo. A leaflet has also been published on Type C Matthews "teleheight." This device gives the exact height in feet of any object from 18 ft. to 60 ft. above the point on which the observer is standing.

Insulated Wire.—The Peerless Insulated Wire & Cable Company, of 18 Broadway, New York, has just issued a small folder of interest to the prospective purchaser of insulated wire. In it are given the results of some recent tests made by the Electrical Testing Laboratories on samples of this company's product immersed in water for various periods. These tests indicate a high insulation standard for the product in question.

Portable Meters.—The latest publication of the Wagner Electric Manufacturing Company is entitled "A Manual of Electrical Testing," and Wagner portable instruments furnish the theme. The design, manufacture and use of these meters are first discussed, and after that, under the heading of general notes on electrical testing, a number of test methods are described in which Wagner meters can be used to advantage. Data on the various types of these meters are given at the end of the pamphlet.

Meter.—The Blonck boiler efficiency meter is the subject of a pamphlet recently published by W. A. Blonck & Company, Fisher Building, Chicago, Ill., bearing the title "A Key to Higher Efficiency in the Boiler Plant." Some practical information is given as to the actual performance of the Blonck meter, accompanied by numerous curves and diagrams. This device will, it is claimed, give instantaneous indication of any abnormal condition leading to the waste of fuel and will indicate the relative load being carried by the boilers.

Mechanical Transmission by Flexible Wires.—An eight-page pamphlet has been issued by the J. S. Bretz Company, 250 West Fifty-fourth Street, New York, importer of the Bowden wire mechanism for the transmission of reciprocating motion through a flexible and tortuous route. A full description of the uses of the device and a few hints on fitting the mechanism are given; also an illustration showing the principle of operation. Another pamphlet issued by this company gives the United States Price List for Bowden control apparatus for motor cycles, motor cars and other Bowden accessories.

Personal Mention

Mr. B. J. Grigsby, managing director of the Benjamin Electric, Ltd., of London, England, sailed from that city on April 24 for an eight weeks' trip in the United States in the interests of his company.

Mr. H. H. Rice, president of the Waverley Company, Indianapolis, Ind., manufacturer of electric vehicles, was elected president of the National Metal Trades Association at its recent convention in Worcester, Mass.

Mr. Dana Pierce, electrical engineer and agent at New York of the Underwriters' Laboratories, sailed on May 2 for England to visit the recently established London office of the laboratories, which is engaged in the examination and test of electrical and other goods manufactured in Great Britain.

Mr. Guy E. Tripp, chairman of the board of directors of the Westinghouse Electric & Manufacturing Company, has been elected president of the West Penn Traction Company of Pittsburgh, Pa. The latter company is controlled by the West Penn Traction & Water Power Company, which is in turn controlled by the reorganized American Water Works & Electric Company.

Mr. W. B. Brockway, who has been connected in executive capacities with various Ford, Bacon & Davis properties since 1900, has resigned from that firm to become comptroller of the Berlin Mills Company, with general offices at Portland, Maine. Mr. Brockway was identified with steam-railroad operating and accounting work prior to 1896. From 1896 to 1900 he was secretary and treasurer of the Toledo, Bowling Green & Fremont Railway, Toledo, Ohio. In 1900 he was appointed secretary-auditor of the New Orleans & Carrollton Railroad, Light & Power Company, New Orleans, La., and soon after became general auditor of the various Ford, Bacon & Davis and Newman properties in the South and West. In this responsible position Mr. Brockway acquired a very extensive knowledge of electric railway, lighting and gas accounting property under different conditions, and his experience on these lines became very valuable. He has also done a great deal of work and occupied executive positions during the past fourteen years with various public utility properties with which Ford, Bacon & Davis were connected, among others that of secretary and treasurer of the Sierra & San Francisco Power Company, which supplies power to the United Railways of San Francisco. Mr. Brockway has always taken a prominent part in the affairs of the American Electric Railway Accountants' Association. In 1906-7 he served as its president. He is the author of "Electric Railway Accounting," published in 1906. The Berlin Mills Company, with which Mr. Brockway becomes connected, is the outgrowth of the business established in 1852. The company manufactures newspaper, sulphite, fiber and timber. It has a paper mill at Berlin, N. H., with a capacity of 250 tons a day. Its timber lands are situated in Maine and New Hampshire, and it has extensive timber rights in Canada.

W. B. BROCKWAY

Mr. John P. Mallett, who has been engaged by the Society for Electrical Development, Inc., to investigate the application of electricity in the arts and industries, is a graduate of Tufts College, where he took a course in electrical engineering. His experience includes six years with the Westinghouse Electric & Manufacturing Company, eight years as chief engineer of the Northern Electric Manufacturing Company, and five and a half years as engineer in charge of the department of the development of special apparatus for commercial and government work at the Diehl Manufacturing Company.

Mr. S. B. Way has been made general manager of the Milwaukee Electric Railway & Light Company and the Milwaukee Light, Heat & Traction Company, the election being announced by Mr. James D. Mortimer, president of the North American Company, on April 21. Mr. Way became assistant general manager of the Milwaukee companies in November, 1911, and early in the year 1912 was elected vice-president. He is now placed in charge of the local management of the companies, his promotion being a deserved recognition of the ability he has demonstrated as a public-utility manager and executive. Mr. Way is thirty-nine years old and received his technical education at Drexel Institute, Philadelphia. He began his business career with the Electric Storage Battery Company of Philadelphia, for which he became erecting engineer. In 1898 he left the service of that company to become electrical superintendent of one of the electric-service companies in St. Louis, which later became the present Union Electric Light & Power Company of that city. Mr. Way remained in the service of the St. Louis company until appointed assistant general manager of the Milwaukee companies as related. In addition to his duties in Milwaukee Mr. Way is also actively interested in the management of the Wisconsin Gas & Electric Company, operating in Racine and Kenosha; the Watertown (Wis.) Gas & Electric Company, the Burlington (Wis.) Electric Light & Power Company, and the North Milwaukee Light & Power Company. He has been identified with public-utility business for nearly sixteen years, and during practically all that time has been associated with the interests that pertain to the North American Company.

S. B. WAY

Mr. Ernest Gonzenbach, formerly president and general manager of the Sheboygan (Wis.) Railway & Electric Company, has been appointed general manager of the Empire United Railways, Inc., of Syracuse, N. Y. The latter is a consolidation of the Rochester, Syracuse & Eastern Railway, the Syracuse, Lake Shore & Northern Railroad and the Auburn & Northern Electric Railroad. The company controls 138 miles of line, and affiliated with it are the Syracuse, Watertown & St. Lawrence River Railroad, the Newark & Marion Railway, the Sagamore Navigation Company and the Skaneateles Lake Transportation Company. Mr. Gonzenbach, who is well known in the electric-railway field and is the author of "Engineering Preliminaries for an Interurban Electric Railway," took charge of the property at Sheboygan in 1905 as general manager. He was later elected treasurer and subsequently vice-president and president. He is Swiss by birth and education and after acquiring electrical experience in power-house work in Chicago he completed the Thomson-Houston course at Lynn, Mass. In 1895 he constructed several electric-light plants in St. Johnsbury, Vt., and vicinity. Three years later he entered the employ of the Westinghouse Electric & Manufacturing Company, leaving that company in 1900 to become electrical engineer of the Albany and Hudson Railroad, one of the early third-rail roads. Subsequently he accepted a similar position with the Aurora, Elgin & Chicago Railroad, then under construction, after which he was engaged as consulting engineer, principally in the construction of the Youngstown & Southern Railway. In 1909 Mr. Gonzenbach was elected president of the Wisconsin Electrical Association.

ERNEST GONZENBACH

Construction

New England

BAR HARBOR, MAINE.—The Bar Harbor & Union River Pwr. Co., of Bar Harbor, is planning to extend its transmission line from Ellsworth to Blue Hill, a distance of 18 miles.

MONTPELIER, VT.—The Consol. Ltg. Co., of Montpelier, has begun work on the construction of a transmission line from No. 5 station, the upper Corry Deavitt Frost electric plant, to Plainfield, a distance of 6½ miles. The line will connect with the Molly Falls circuit at a station near the railroad depot.

FALL RIVER, MASS.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until May 25, for alterations in the heating, lighting systems, etc., in the United States custom house and post office in Fall River, in accordance with drawings and specifications. For details see proposals columns. O. Wenderoth is supervising architect.

HUNTINGTON, MASS.—The Boston & Abany R. R. Co. is planning to erect an electric power plant near the station in Huntington to furnish electricity for lighting its signals along the line between this station, the Chester and the Westfield stations.

MARION, MASS.—The Marion Gas Co. is reported to be securing the right-of-way for a transmission line through Wareham, which is to extend to Bourne and Carver, connecting with the extension now being erected by the Plymouth El. Lt. Co. on the South Meadow and Federal Furnace roads in Plymouth to the Carver line.

NORTH ABINGTON, MASS.—The El. Lt. & Pwr. Co., of Abington, is erecting a high-tension transmission line from the local station to the Cohasset station and thence to Greenbush, where the company will furnish 300 hp to the parties who have the contract for cutting away Coleman's Hill.

UNIONVILLE, CONN.—Within the next eight months the Union El. Lt. & Pwr. Co., of Unionville, expects to erect a new substation and about 8 miles single-circuit, 2200-volt, three-phase transmission line.

WILLIMANTIC, CONN.—The installation of an ornamental street-lighting system on Main Street, from Windam Street to Lincoln Square, is under consideration. The present plans provide for the installation of fifty-one ornamental iron poles, carrying one 100-watt lamp and four 60-watt lamps.

Middle Atlantic

DUNDEE, N. Y.—The Town Council has granted a franchise to Evelyn H. Bailey, owner of the local electric-light plant, to erect transmission lines and supply electricity in the towns of Starkey and Lakemont, about 3 miles distant.

EDEN, N. Y.—The installation of an electric-light plant in Eden is under consideration. E. C. Warner is interested.

LESTERSHIRE, N. Y.—The installation of a new street-lighting system in the near future is under consideration. The plans provide for the erection of 155 lamps, one for every street corner, and boulevard lamps on Main Street.

MIDDLETOWN, N. Y.—The Public Service Commission has granted the Orange County Ltg. Co., of Middletown, permission to issue $73,400 in bonds, the proceeds to be used for additions and improvements to its lighting system.

NEW YORK, N. Y.—The contract for installing electrical equipment in Public School 51, borough of Bronx, has been awarded by J. B. Snyder, superintendent of school buildings, to the New York Constr. Co., at $10,840.

NEW YORK, N. Y.—The contract for the construction of Section No. 1 of Routes 4 and 38 of the Seventh Avenue subway in the borough of Manhattan has been awarded to the Rapid Transit Subway Construction Co., at $2,121,077.

NIAGARA FALLS, N. Y.—The Board of Public Works has approved the proposal to extend the ornamental lighting system on Main Street to Falls Street, at a cost of $20,000.

ROCHESTER, N. Y.—A permit has been granted to the Cutlery Realty Co. for the erection of a central power plant (49 ft. by 70 ft.) at Euclid and Atlas Streets. A chimney 160 ft. high is also to be built.

ROCHESTER, N. Y.—The question of erecting lamps on the East Henrietta Road from Elmwood Avenue south has been taken up with the Rochester Ry. & Lt. Co. by Supervisors Hiram Shaw and DeForest Harmon. The district will include a part of the old fair grounds, later known as Crittenden Park.

WEEDSPORT, N. Y.—A special election will be held May 4 to submit the proposal to issue $18,000 in bonds to establish a municipal electric-light system. It is proposed to secure electricity from the Niagara Power Co. to operate the plant. The taxpayers will also vote on a proposition to contract with the Empire Gas & El. Co., of Auburn, to furnish street-lighting for a period of five years, at $2,296 per year.

DORMONT, PA.—Bids will be received by C. D. Dorning, borough clerk, 2967 Epsy Avenue, Pittsburgh, until May 8 for furnishing 50 or more (gas or electric) lamps for a period of two, three or five years, the contract to date from July 25, 1914, as follows: Electric lamps—100-watt street series tungsten lamps, 250-watt street series tungsten lamps, arc lamps; gas lamps—80-cp single inclosed Welsbach lamps.

LANCASTER, PA.—Bids will be received by A. F. Mowery, superintendent of the Frank E. Wilson Mfg. Co., corner Columbus and Wheeling Streets, Lancaster, Ohio, for construction of building, including general construction work, electric lighting, electric elevator, complete with safety devices, hot-water-heating system, etc. Plans and specifications may be obtained on application to A. F. Mowery, superintendent.

LEBANON, PA.—Plans are at present being considered for the installation of an electric-light plant in Lebanon to supply electricity for lamps and motors in the Lebanon valley. It is proposed to utilize the overflow water from the mineral spring in the Columbia Hall property in Lebanon Springs.

SCRANTON, PA.—Improvements will be made by the Scranton El. Co. in Scranton and the valley during the year, involving an expenditure of about $1,000,000. A large portion of this will be used for the installation of new machinery at the suburban plant on North Washington Avenue and the illuminating plant on the bank of the Lackawanna River.

SOMERSET, PA.—P. J. Morrissey, of Johnston, general manager of the Penn Pub. Ser. Co., has submitted a proposal to the Borough Council for the installation of a new street-lighting system, one for a three-year, one for a five-year and one for a ten-year term. The proposal provides for changing the 37 arc lamps now in use for 77 incandescent lamps, of which 33 would be of 200 cp, 19 of 100 cp and 26 of 80 cp.

YORK, PA.—Plans are being prepared for an addition to the steam auxiliary power plant of the Edison Lt. & Pwr. Co. at the rear of West Philadelphia and Water Streets, to increase the output of the plant by 6000 hp. The cost of the work is estimated at $200,000.

BUTLER, N. J.—The water and light committee has recommended to the Council the construction of an electric-light plant, the cost not to exceed $30,000.

CAMDEN, N. J.—The Public Ser. El. Co. has asked for permission to place underground conduits on Federal Street, from Cooper Street to the Delaware River.

NEWTON, N. J.—The Board of Public Utility Commissioners has instructed the Newton Gas & El. Co. to make improvements and necessary additions to its gas and electric plants to provide proper and adequate local service. W. L. Keplinger is receiver for the company.

SAYREVILLE, N. J.—The township committee is contemplating the installation of a street-lighting system in the Morgan Heights section. The Sayreville El. Lt. & Pwr. Co. furnishes the local service. Josiah Tice, township engineer, will have charge of the work.

EASTON, MD.—A commission, consisting of Martin M. Wright, Harry Clark, T. Hughlett, Col. James C. Mulliken and M. M. Higgins, has been appointed to take charge of construction of a municipal electric-light plant, to cost about $30,000. The proposed plant will furnish electricity for lighting the town and for power purposes.

MOUNT RANIER, MD.—The laws passed at the last session of the State Legislature authorizing the Mayor and the Council to issue $125,000 in bonds for the installation of an electric-light plant, waterworks and sewer system were ratified by the voters on April 23.

FAIRMONT, W. VA.—The Fairmont & Clerksburg Pwr. Co., of Fairmont, has applied to the Public Service Commission for permission to construct a dam and power plant at Valley Falls in Marion and Taylor Counties for the development of hydroelectric power. In addition to the Valley Falls project the company contemplates building a dam on the Buckhannon River and another power plant and dam near Pleasant Creek. It is understood that the dam at Audrey, which was first proposed by the company, has been abandoned.

MORGANTOWN, W. VA.—The Morgantown & Wheeling R. R. Co., it is reported, is contemplating the erection of two substations in connection with the construction of 15 miles of trackage between Morgantown and Wheeling.

LYNCHBURG, VA.—The city of Lynchburg, it is reported, is contemplating the installation of an electric-light plant.

LYNCHBURG, VA.—The Soutnern Ry. Co., it is reported, contemplates the construction of a power plant in Lynchburg to supply electricity to operate block signal and buildings and equip substations at other points. B. Herman, of Washington, D. C., is chief engineer.

WASHINGTON, D. C.—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until May 19, for furnishing at the various navy yards and naval stations supplies as follows: Portsmouth, N. H., Schedule 6689—two 20-hp boilers complete. Brooklyn, N. Y., Schedule 6712—5400 ft. steel-armored submarine (twisted-pair) five-pair telephone cable; Schedule 6713—90 round standing lamps, miscellaneous lead pipe for lining steel tubing; Schedule 6691—one motor-driven, band-sawing machine, one motor-driven, vertical mortiser, one motor-driven revolving grinder and oil-stone; Schedule 6701—miscellaneous No. 1, Morse taper shank, straight, right-hand end mills. Washington, D. C., Schedule 6699—1165 lb. miscellaneous cold-rolled sheet copper, 5025 lb. miscellaneous chemical lead pipe. Norfolk, Va., Schedule 6714—one horizontal single feed pump. Philadelphia, Pa., Schedule 6690—four right-hand and left-hand motor-driven 3-in. horizontal centrifugal pumps. Bids will also be received until May 26 as follows: Charleston, S. C., Schedule 6711—one motor-driven radial wall drill, two punching machines, one single-end shearing machine, two motor-driven squaring or gate shears, three sets bending rolls; Schedule 6710—one motor-driven bulldozer bending machine; Schedule 6704—one electric freight elevator. Washington, D. C., Schedule 6703—one electric furnace for shrinking pit for 5-in. 50-caliber gun; Schedule 6709—100 head telephone sets. Philadelphia, Pa., Schedule 6706—one motor-driven wet and dry grinder. Bids will also be received until June 30 for furnishing at the navy yards at Brooklyn, N. Y., Boston, Mass., Norfolk, Va., and Charleston, S. C., 42 searchlights, spare parts and signaling shutters, 24 in., as per Schedule 6694. Applications for proposals should designate the schedule desired by number. T. J. Cowie is paymaster-general, United States Navy.

North Central

HIGHLAND PARK, MICH.—The installation of an ornamental street-lighting system is under consideration. Electricity for maintaining the lamps will be supplied by the Edison Illg. Co., of Detroit, pending the construction of a municipal electric-light plant.

ISHPEMING, MICH.—The Marquette County Gas & Elec. Co., of Ishpeming, contemplates making improvements to its electric-lighting and gas systems this summer. As soon as the weather will permit work will begin on the erection of a high-tension line to Palmer. A. C. Harrington is general manager.

MANISTEE, MICH.—We are informed that the city of Manistee does not contemplate the construction of a municipal electric plant as it is under contract with a private company for lighting until 1918. Reported in the issue of April 11 that the proposal to issue $35,000 in bonds to construct a gravity dam and power plant would be submitted to the voters this month. J. Christensen is city clerk.

NORTHVILLE, MICH.—The Edison El. Illg. Co. of Detroit has submitted a proposal to the Council offering to purchase the municipal electric-light plant and furnish electrical service here.

PONTIAC, MICH.—A committee has been appointed by the Pontiac Commercial Association to promote the installation of a new street-lighting system in the business section of the city.

UNIONVILLE, MICH.—Preparations are being made to install a municipal electric-light plant here, to cost about $8,000.

FREMONT, OHIO.—The Home Tel. Co., of Fremont, contemplates improvements to its system, including new cable lines, etc., to cost about $40,000. George W. Seaman is manager.

FREEPORT (PRAIRIE DEPOT), OHIO.—Contracts have been awarded by the village of Fremont to C. H. Hoiles, of Prairie Depot, for lighting the streets and municipal buildings in Freeport for a period of ten years.

LIBERTY CENTER, OHIO.—The contract for installing the electric-light system has been awarded to the D. R. Shea Elecl. Construction Co., of Defiance. Electricity for operating the system will be obtained from the Defiance-Toledo transmission line of the Auglaize Pwr. Co., of Defiance. Tungsten lamps will be used for street lighting.

OAK HARBOR, OHIO.—Contracts have been awarded by the Board of Public Affairs for the construction of the municipal electric-light plant as follows: To W. G. Nagel Co., of Toledo, for switchboard, at $1,302; Joseph Skeldon Engineering Co., of Toledo, for pumps, at $1,340; for general construction to the Gangle-Harbaugh Co., of Akron, at $7,169.

PORTSMOUTH, OHIO.—Bids will be received by the Portsmouth St. R. R. & Lt. Co. until May 15 for furnishing material and building 22 miles of electric railway. Plans and specifications may be obtained upon application to the company, for which a deposit of $10 will be required, to be refunded upon return of plans.

SPRINGFIELD, OHIO.—Plans, it is reported, will be prepared by M. J. Bahin, city engineer, for a cluster-lamp lighting system in the central section of the city.

SULLIVAN, OHIO.—The Council is considering the question of establishing an electric-light system in Sullivan.

WEST UNION, OHIO.—We are informed that as yet definite action has not been taken in regard to the installation of a municipal electric-light plant. C. W. Riffle is engineer in charge of the plans.

HODGENVILLE, KY.—C. L. Herron, owner of the local electric-light plant, is considering a proposal to furnish electrical service in Buffalo, from the plant in Hodgenville.

HOPKINSVILLE, KY.—The Kentucky Pub. Ser. Co. will replace the present arc-lamp street-lighting system with incandescent lamps. The new system will consist of 20 lamps of 600 cp, 80 lamps of 400 cp and 51 lamps of 80 cp; the 600-cp and 400-cp lamps to be of the nitrogen type. General Electric fixtures and Bryan-Marsh lamps will be used. A. C. Choate is superintendent.

LAWRENCEBURG, KY.—The Kentucky Public Utilities Co., it is reported, is remodeling the ice plant of the old Lawrenceburg El. Lt. Co. and will equip it with electrically operated machinery.

LOUISVILLE, KY.—Plans are being considered by D. Long Miller and others to organize a company, to be known as the Bluegrass Improvement Co., to construct a hydroelectric plant. It is proposed to obtain permission from the government to develop water-power at Dam No. 41 on the Ohio River.

McBRAYER, KY.—Davis Brown, of J. T. S. Brown & Sons, it is reported, will install an electric plant to furnish electricity for lamps and motors for his new summer residence and for lighting the brewery and warehouses in McBrayer.

CRAWFORDSVILLE, IND.—Within the next 30 days the Crawfordsville El. Lt. & Pwr. Co. expects to purchase one two-circuit 100-lamp mercury rectifier and 10 magnetite arc lamps. F. H. Miller is superintendent.

EDINBURG, IND.—Within the next two months the Board of Electric Light Commissioners expects to purchase two 250-hp steel-incased return tubular boilers. George R. Mutz is superintendent.

LIGONIER, IND.—Within the next six months Lyon & Greenleaf, owners of the local electric-light plant, expect to purchase one boiler.

RENSSELAER, IND.—The city of Rensselaer expects to purchase at once conduit for ornamental street-lighting system and to purchase within the next few months 42 ornamental lamp standards. C. S. Chamberlain is superintendent.

APPLE RIVER, ILL.—The Warren El. Pwr. & Lt. Co., of Warren, recently granted a franchise in Apple River, has been awarded a contract for lighting the streets of the village. E. J. White is village clerk.

CHICAGO, ILL.—The Sanitary District of Chicago has awarded the contract for electrical equipment, etc., for the Lincoln Street and Rice Street substations to the W. A. Jackson Co., of Chicago, at $26,800.

CHICAGO, ILL.—The engineering committee of the Sanitary District has voted to advertise for bids on 2000 new nitrogen lamps which are to be supplied to the city; also to advertise for bids on synchronous condensers.

CHICAGO, ILL.—Bids will be received by John McGillen, clerk of the Sanitary District of Chicago, South Michigan Avenue, Chicago, Ill., until May 7 for furnishing electrical apparatus and supplies, including impedance coils, steel poles, arc-lamp windlasses, ornamental pole bases, base pole seats and insulated lead-covered cable. For further details see proposals columns.

EAST DUBUQUE, ILL.—The citizens have voted to authorize the City Council to grant the Union El. Co., of Dubuque, Ia., a franchise to furnish electricity in East Dubuque for street-lighting and for operating the municipal water department. The company agrees to furnish an all-night street-lighting service and to install 26 arc lamps of 400 cp. E. M. Walker is general manager of the Union El. Co.

FREEBURG, ILL.—Within the next two months the town of Freeburg expects to purchase equipment to change the municipal electric-light plant from direct to alternating current. The street-lighting system will also be changed to alternating-current series system. Oliver Hankammer is superintendent.

MONTICELLO, ILL.—The Monticello El. Lt. & Pwr. Co. may possibly purchase within the next few weeks two generators (60 cycles) and exciters to replace the 133-cycle generators now in use. John A. Glover, of Urbana, is general superintendent.

ROCK ISLAND, ILL.—The city is negotiating with the People's Pwr. Co., of Rock Island, for a new contract for street lighting. Under the new arrangement there will be about 640 street lamps against 300 under the present contract, of which 440 will be tungsten lamps and 200 arc lamps.

STERLING, ILL.—The Northwestern Barb Wire Co., of Sterling, expects to purchase a 300-kw, three-phase, 60-cycle, 200-volt directly connected generating unit.

EAU GALLE, WIS.—The Durand Lt. & Pwr. Co., of Durand, is reported to be contemplating the construction of a new power house and the installation of new equipment in Eau Galle, at a cost of about $10,000. H. A. Miles, of Durand, is manager.

PRESCOTT, WIS.—The New River Falls Pwr. Co., of Prescott, it is reported, has decided to build another hydroelectric plant and a 90-ft. reinforced concrete dam across the Kinnickinnic River at a point about a mile above the present power plant at Clifton.

UNION GROVE, WIS.—The village of Union Grove has voted to grant William Hardy a franchise to construct and operate an electric-light plant here. Under the terms of the franchise Mr. Hardy is to furnish 30 street lamps of 120 cp.

WEST SALEM, WIS.—Preparations are being made by the Neshonac Lt. & Pwr. Co., of West Salem, for the construction of a hydroelectric power plant. The equipment will consist of one 120-hp waterwheel, 150 r.p.m., operating under a 10-ft. head, and Lombard governor for same; one 75-kw, three-phase, 150 r.p.m., umbrella-type generator; one 60-kw, three-phase generator, belted; one switchboard for three-phase current; ten 1-kw, five 10-kw and three 5-kw transformers; 40 30-ft. (6-in. top) poles, some 35-ft. (6-in. top) poles, and some lightning arresters. Wire and insulators for transmission line have been purchased. Work will soon begin on the plant. E. C. Swarthout is president and manager.

COMFREY, MINN.—Bids will be received by G. W. Schaffer, village clerk, until May 5 for the erection of an electric-light plant as follows: (1) Brick building; (2) oil engines; (3) electrical equipment; (4) pole line. Bids will be received on the whole or on separate divisions. W. C. Buck, 151 Curtis Court, Minneapolis, is consulting engineer.

MINNEAPOLIS, MINN.—During the coming year the Twin City Rapid Transit Co. will expend about $2,000,000 in extensions and improvements to its properties in Minneapolis and St. Paul, part of which is already under way. At least one-quarter of the amount will be expended on the new generating station in Minneapolis; in addition, about 16 miles of extensions will be built in this city.

MINNEAPOLIS, MINN.—Bids will be received by the State Board of Control, State Capitol Building, St. Paul, until May 11 for the construction of a Ladies' Gymnasium Building of the University of Minnesota, including general contract work, heating and ventilating, plumbing and electrical work, in accordance with plans and specifications prepared by C. H. Johnston, architect, Capital Bank Building, St. Paul. Bids will be received collectively and separately. Copies of plans and specifications may be seen at the office of the State Board of Control, at the office of George H. Hayes, comptroller University of Minnesota, and at the St. Paul and Minneapolis Builders' Exchanges.

ST. PETER, MINN.—Bids will be received by the State Board of Control, State Capitol Building, St. Paul, until May 7 for the fireproofing and improvements to South Wing, first and second stories, second hall section, State Hospital, St. Peter, including general contract work, heating and ventilating, plumbing and electric work in accordance with plans and specifications furnished by C. H. Johnson, architect, Capital Bank Building, St. Paul. Bids will be received collectively and separately. Copies of plans and specifications may be seen at the office of the State Board of Control; at the office of the superintendent of the St. Peter State Hospital, St. Peter, and the St. Paul and Minneapolis Builders' Exchanges.

ST. PAUL, MINN.—Bids will be received by the State Board of Control, State Capitol Building, St. Paul, Minn., until May 15, for additions to Crippled Children's Hospital, Phalen Park, Minn., including general contract work, heating and ventilating, plumbing and electrical work, in accordance with plans and specifications furnished by C. H. Johnston, architect, Capital Bank Building, St. Paul. Bids will be received separately or collectively. Copies of plans and specifications may be seen at the office of the State Board of Control, Crippled Children's Hospital, Phalen Park, and the St. Paul and Minneapolis Builders' Exchanges. Extra copies of plans and specifications may be obtained on application to the architect on payment of cost of duplication.

ADAIR, IA.—Within the next three months the town of Adair expects to erect a transmission line to Casey, Ia. A 150-hp Ridgway engine, a 100-kw generator and switchboard were installed in the municipal electric-light plant last February. C. E. Morse is manager.

AFTON, IA.—Within the next four months the managers of the municipal electric-light plant expects to purchase material for 2 miles of new line. L. T. Brown is superintendent.

ALBIA, IA.—Within the next six months the Albia Interurban Ry. Co. expects to erect 17 miles of transmission lines; also within the next two months to purchase a 200-kw rotary converter, transformers, poles, transmission towers, insulators, incandescent lamps, etc. E. C. Manning is general manager.

CEDAR RAPIDS, IA.—The State Railroad Commission has granted the Iowa Ry. & Lt. Co., of Cedar Rapids, a franchise to erect a transmission line from Cedar Rapids to Tama, as part of the proposed line to Marshalltown. The company, it is said, will eventually extend the line to Boone.

DOWS, IA.—The Dows El. Lt. & Pwr. Co. expects to erect about 1 mile of pole-line extension within the next six months; also to purchase 24 fans (various types), six washing machines, and 24 "Hotpoint" stoves. G. D. Remer is superintendent.

MASON CITY, IA.—The Council has called a special election to be held May 11 to submit the proposal to grant a franchise to the People's Gas & El. Co., of Mason City, for a period of 25 years.

ROCKWELL CITY, IA.—The Calhoun County Pub. Ser. Co., of Rockwell City, expects to erect within the next 6 months 16 miles of transmission lines and three outdoor substations and to purchase equipment for same; also posts for lighting system. L. S. Boyce is manager.

KANSAS CITY, MO.—The Board of Park Commissioners is considering two propositions calling for overhead wiring in Swope Park. A proposition has been submitted to install a trackless trolley in the park. The board will choose between this system and granting a franchise to the Metropolitan St. Ry. Co., which would allow the latter to extend its lines into the park. The Council has passed ordinances providing for the installation of tungsten lamps on certain streets.

PALMYRA, MO.—Plans are being prepared by Freeman D. Martin, engineer, 420 Rialto Building, Kansas City, Mo., for an electric-light plant for Palmyra, to cost about $30,000.

ST. LOUIS, MO.—The El. Co. of Missouri, with headquarters in St. Louis, is contemplating extending its transmission lines to several towns in St. Louis County, including Manchester, Ellisville, Crescent, Eureka and Glencoe.

LANKIN, N. D.—Steps have been taken by the Village Board to secure street-lighting service in Lankin.

PORTAL, N. D.—The installation of a central power plant in Portal to supply electricity in Portal, Bowbells and Flaxton, and possibly one or two other cities, is under consideration. The cost of the plant is estimated at $35,000.

IROQUOIS, S. D.—The local electric-light plant is reported to have been purchased by Clayton Stoner and William Jordan.

SIOUX FALLS, S. D.—Bids will be received until May 21 by Bishop Biller, Sioux Falls, for construction of a fireproof building, to be known as the Bishop Hare Memorial, for All Saints' School at Sioux Falls, including heating, ventilating, plumbing and electric wiring, in accordance with plans and specifications prepared by Robert Perkins, architect, copies of which may be obtained on application to Bishop Biller. Plans are on file at the Builders' Exchange in Minneapolis, Minn.

GREELEY, NEB.—The Commercial Club of Greeley is reported to be negotiating with Frank Arnold, of Fullerton, for an electric-light system for Greeley. Mr. Arnold proposes to establish a plant and furnish electrical service to a number of towns.

MEAD, NEB.—All bids received April 17 for construction of a municipal electric-light plant were rejected. New bids will be asked for in the near future. E. E. Fetz is chairman of lighting committee.

ORD, NEB.—The property of the Ord El. Lt. Co. is reported to have been purchased by Peter and H. O. Hallen, of Iowa. The new owners, it is said, propose to make improvements to the plant.

SUPERIOR, NEB.—The Southern Nebraska Pwr. Co., of Superior, has applied to the Nebraska Railway Commission for authority to issue $100,000 in capital stock and $200,000 in bonds, the proceeds to be used for the construction of a hydroelectric power plant on the Republican River, near Superior. The company proposes to furnish electricity to about 20 towns in Nebraska, to which high-tension transmission lines will be erected.

WAKEFIELD, NEB.—The town of Wakefield has granted G. Wendt, of Winside, a franchise to construct and operate an electric-light plant here for a period of 15 years.

DODGE CITY, KAN.—The Midland Wtr. Lt. & Gas Co., of Dodge City, it is reported, is contemplating extending a transmission line to the Plains Academy near this city.

EFFINGHAM, KAN.—Bonds to the amount of $12,000 have been voted for the installation of a municipal electric-light plant in Effingham.

GARDEN CITY, KAN.—The Garden City Irrigation Pwr. Co., recently incorporated as a subsidiary of the Garden City Sugar & Land Co., has been granted permission to sell electricity in Kansas and is planning to extend its transmission lines 40 miles up the Arkansas Valley. The company will supply electricity for irrigation projects.

HORTON, KAN.—The contract for the erection of the new city hall is reported to have been awarded to Scott Brothers, of Concordia. A lighting plant, it is understood, will be installed in connection with the building.

PITTSBURG, KAN.—The Kansas Utilities Commission has authorized the Fort Scott & Pittsburg Ry. Co., of Pittsburg, to issue $950,000 in bonds for the construction and equipment of its proposed railway.

PITTSBURG, KAN.—The contract for furnishing poles for lighting 22 blocks, of the combined trolley-pole type with four pendent lamps and ball globes, has been awarded to the United Iron Works Co., of Pittsburg, at $12,384. L. E. Curfman is city engineer.

VERMILLION, KAN.—Bonds to the amount of $7,000 have been voted for the erection of a transmission line from Vermillion to Frankfort. Electricity for operating the local system will be supplied from the electric plant in Frankfort.

Southern States

BEAUFORT, N. C.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until May 23 for one 200-ft. steel tower with concrete foundations at the radio station at Beaufort. Plans and specifications can be obtained on application to the bureau. H. R. Stanford is chief of bureau.

WARSAW, N. C.—The city of Warsaw has engaged the J. B. McCrary Co., of Atlanta, Ga., to survey site, prepare plans and estimates of cost of installation of an electric-light plant, water-works and sewer system; the cost is estimated at from $35,000 to $50,000.

FLORENCE, S. C.—The city of Florence has closed a contract with the Florence El. & Utility Co., whereby a complete new street-lighting system will be installed. The new contract calls for the new nitrogen lamps to be erected on brackets.

CALDWELL, GA.—The installation of a municipal electric-light plant in Caldwell is reported to be under consideration.

CARTERSVILLE, GA.—The Georgia Pwr. Co., of Atlanta, it is reported, is contemplating the construction of a hydroelectric power plant (to develop 30,000 hp) on the Etowah River, 4 miles from Cartersville.

EATONTON, GA.—The City Council is contemplating issuing bonds for the construction of a hydroelectric plant. The city may purchase the Griffin mill water-power site on Little River.

LAWRENCEVILLE, GA.—The city of Lawrenceville expects to purchase within the next six months some medium-sized 30-ft. chestnut poles, a few lightning arresters for 2200-volt transmission line, 50 or more 6.6-amp tungsten street lamps (100 cp to 200 cp). The city would also like to receive catalogs on cooking devices, electric irons, etc. Edward Tarpley is city electrician.

MANSFIELD, GA.—At an election held April 20 bonds to the amount of $15,000 were voted for the installation of a municipal electric-light plant. J. G. Harwell, Jr., is town clerk.

DAYTONA, FLA.—It is reported that J. W. Wilbur, of Brookline, Mass., is interested in a project to establish an electric-light plant at Wilbur-by-the-Sea.

JACKSONVILLE, FLA.—The contract for remodeling the old water-works station as a substation and pumping station has been awarded to F. W. Long, of Jacksonville, at about $35,000.

MICANOPY, FLA.—Arrangements are being made for the installation of a municipal electric-light plant, for which bonds to the amount of $10,000 have been voted.

TAMPA, FLA.—Bids will be received by the Board of Public Works, Tampa, until May 12 for the construction of city hall and police headquarters. Bids will also be received at the same time for furnishing and installiing complete elevator equipment in both buildings. Plans and specifications may be obtained upon application to Bonfoey & Elliott, architects, Tampa, for which a deposit of $50 will be required, $40 of which will be refunded upon return of plans. D. B. McKay is chairman of board.

WEST PALM BEACH, FLA.—The Arsiton Ice & El. Co., of West Palm Beach, has recently completed the installation of a 300-kw General Electric turbo-generator set. C. H. Ellis is manager.

CHATTANOOGA, TENN.—Electricity for operating the new plant of the American Home & Singletree Co. in Chattanooga will be supplied by the Chattanooga Ry. & Lt. Co. About 150 hp will be required.

ELKMONT, TENN.—The Appalachian Club is contemplating enlarging its electric-light plant and water-works system here. For further information address the secretary of the club at Knoxville.

JACKSON, TENN.—An electric light and power plant, it is reported, will be installed in the new town settlement that the Wolf Valley Coal Co. is building for its employees in Eastern Kentucky, near the town of Jackson.

GADSDEN, ALA.—The Gulf States Steel Co., it is reported, has practically closed a contract with the Alabama Pwr. Co., by which the latter will furnish 3000 hp to operate the Gadsden steel mills. The steel company, it is understood, will install new electrical machinery, at a cost of about $40,000.

HARTSELLS, ALA.—The City Council has granted J. R. White a franchise to construct and operate an electric-light plant in Hartsells for a period of 30 years.

OZARK, ALA.—Bonds to the amount of $25,000 have been voted for improvements to the municipal electric-light plant and water-works system. B. C. Bowling is superintendent.

RAMSAY SPRINGS, MISS.—The Ramsay Mineral Springs Co., recently organized with a capital stock of $20,000, contemplates the installation of an electric-light plant to furnish electricity for lamps, fans and ice machinery for hotel and bungalows to be erected by the company. G. A. McHenry, of McHenry, is interested in the company. Ramsay Springs has not a post office.

CLARKSVILLE, ARK.—Preparations are being made by the Clarksville Lt. & Wtr. Co. to establish a 24-hour service May 1.

MAGNOLIA, ARK.—Arrangements are being made by the Arkansas Pwr. Co., which recently purchased the local electric plant, to change the street-lighting system. The number of lamps will be doubled. The plant will be rebuilt, new machinery installed and the output increased.

SNYDER, ARK.—The Renner Mill Co., of Snyder, it is reported, will install an electric-light plant.

NEW ORLEANS, LA.—Bids will be received at the office of the supervising architect, Treasury Department, New Orleans, La., until May 14, for furnishing and installing lighting fixtures in the United States post office and court house at New Orleans, in accordance with drawings and specifications, copies of which may be obtained at the above office or at the office of the custodian, New Orleans. O. Wenderoth is supervising architect.

FORT SILL, OKLA.—Bids will be received at the office of the quartermaster, Fort Sill, Okla., until May 20 for the construction, plumbing, heating and lighting of bachelor officers' quarters at Fort Sill.

EL PASO, TEX.—The El Paso El. Ry. Co. is contemplating the installation of additional machinery in its power plant.

Pacific States

EVERETT, WASH.—The City Council has signed a contract with the Puget Sound Trac., Lt. & Pwr. Co. for the installation of 539 incandescent lamps, ranging from 350 cp to 100 cp. The city is now lighted by 260 arc lamps. It is understood that work will soon begin on the installation of the new system.

MOUNT VERNON, WASH.—The commissioners of Skagit County have granted the Pacific Northwest Trac. Co., controlled by the Puget Sound Trac., Lt. & Pwr. Co., a franchise for the extension of its transmission lines throughout the county. Several smaller towns will be connected with the main transmission line.

SEATTLE, WASH.—The lighting department has accepted the recommendation of J. D. Ross, superintendent, authorizing the purchase of 2000 Sangamo meters and 1000 Westinghouse meters.

SEATTLE, WASH.—Within the next two months the Board of Public Works expects to erect a 500-kw substation at Henderson Street and Ninth Avenue, S. W., Seattle, to furnish electricity for the Lake Burien railway; also to purchase a year's supply of distributing transformers. A contract has just been awarded to W. R. Hendrey & Co., of Seattle, for 10,000 5-kw Fort Wayne meters. Glen Dunbar is chief electrical engineer.

SPOKANE, WASH.—The Spokane & Inland Ry. Co. is contemplating the construction of a new substation at McGuire's, on the Coeur d'Alene division of the road. The building will be 25 ft. by 45 ft., equipped with a rotary converter.

BAKER, ORE.—The power house of the Eastern Oregon Lt. & Pwr. Co. was recently destroyed by fire, causing a loss of about $75,000.

DRAIN, ORE.—The Council has passed an ordinance authorizing the construction of a municipal electric-light plant and a $15,000 bond issue to provide funds for same.

GOLD HILL, ORE.—The Rogue River Pub. Ser. Corpn., of Eugene, it is reported, will build a 5000-hp hydroelectric power plant, at a cost of $500,000, near Gold Hill. It is also reported that a similar plant will be built between this city and Grant's Pass. Both plants will furnish electricity for lamps and motors in nearby towns. George E. Sanders, of Eugene, is president of the company.

PORTLAND, ORE.—Within the next three months the Portland Ry., Lt. & Pwr. Co. expects to purchase regular supplies, including approximately 60 kw in small transformers, 600 poles, etc.; also a regular supply of incandescent lamps and electrical appliances and supplies. O. B. Coldwell is general superintendent.

THE DALLES, ORE.—It is reported that the United States Government machine shop and electric-light plant on the Dalles-Celilo canal project, at Big Eddy, was recently destroyed by fire, causing a loss of about $40,000.

BAKERSFIELD, CAL.—Bids wiill be received by the Board of Supervisors of Kern County, County Court House, Bakersfield, until May 12, for furnishing and installing crushing plant at Keene, near Woodford, on the Southern Pacific Railroad. Competitive designs and bids to be submitted by contractors for an electrically equipped plant of 1000 tons capacity in eight hours. An outline of general requirements and contour maps of the quarry site may be obtained at the office of the Kern County Highway Commission, Bakersfield.

FALL RIVER MILLS, CAL.—The California Pwr. & Mfg. Co., which was recently granted a franchise to furnish electricity in northeastern Shasta County, has begun operations. A transmission line is being erected to Glenburn, where electricity will be supplied for irrigation purposes. The

local power plant, owned by Florin Brothers, upon which the company holds an option, is to be enlarged and the water-power of Fall River utilized as at present. The company also proposes to build another plant at the falls of Hat Creek. Leo Haas, of San Francisco, general agent, is preparing to open an office here.

GLENDALE, CAL.—The Board of Trustees is considering the installation of an electrically operated fire-alarm system. Residents living on the west side of the city have petitioned the city trustees for the installation of electroliers in that section. It is understood that electroliers carying five-lamp clusters, uniform with those already installed in the city, will be erected on two streets.

LOS ANGELES, CAL.—The city officials are considering the installation of an elaborate fire-alarm and police telegraph system in Los Angeles. The safety commission, consisting of Councilman Snowden, Fire Chief Eley, Chief of Police Sebastian and City Electrician Manahan, has charge of the matter.

OCEANSIDE, CAL.—Within the next six months the Oceanside El. & Gas Co. expects to extend its 6600-volt, three-phase transmission line to San Luis Rey and possibly to Carlsbad; also to purchase a four-pole, 50-amp, double-throw oil switch. Eugene V. Griffes is general manager.

RIVERSIDE, CAL.—The Southern Sierras Pwr. Co., of Riverside, is expecting to erect within the next three or four months 165 miles of 55,000-volt (wood-pole line), from San Bernardino to El Centro; also to erect two 900-kva substations and one 3750-kva station, with a 2000-kva synchronous condenser, at El Centro.

SACRAMENTO, CAL.—The city of Sacramento has just completed the installation of an electrolier street-lighting system, consisting of 560 cast-iron electroliers, carrying five-lamp clusters, at a cost of about $100,000. The city is about to advertise for bids for the installation of a municipal street-lighting system, which will consist of 825 6.6-amp magnetite arc lamps to be controlled by rectifiers and regulators, to cost approximately $113,000. The electrolier lighting system is maintained by underground wires. The new street-lighting system will be of aerial construction. All electrical construction is done under the supervision of the Department of Electricity. G. Stanley Pearce is city electrician.

SAN FRANCISCO, CAL.—Preparations are being made by the Pacific Gas & El. Co., of San Francisco, for extensions and improvements to its gas and electric service, at a cost of about $1,000,000. Contracts have been placed by the company for a series of motor-generator sets to enable the company to supply the demand for energy to operate the municipal street-railway system. In connection with this work and also the work about to be undertaken for the Panama-Pacific Exposition, the company finds it necessary to make material additions to its various substations. A new substation will be erected on Twenty-fourth Avenue. The company has entered into a contract with the Sierra & San Francisco Pwr. Co. for additional power to meet the demands of the exposition.

SOUTH PASADENA, CAL.—It is reported that the city has decided to adopt a uniform system of ornamental electroliers throughout the entire city. The standards are to be of steel with copper sheathing.

BOISE, IDAHO.—An order has been issued by Judge Frank S. Dietrich, of the federal court, authorizing the receiver of the Idaho-Oregon Lt. & Pwr. Co., Boise, to issue a receiver's certificate to the amount of $250,000, to be used for the completion of the Oxbow power plant on the Snake River, between Idaho and Oregon.

MOUNTAIN HOME, IDAHO.—Preliminary surveys are being made of the North Fork River for C. C. Burton, recently granted a franchise by the Arkansas Railroad Commission to construct hydroelectric plants on the White, Norfolk and Buffalo Rivers. The first dam, it is said, will be built near the mouth of Otter Creek

BRIGHAM CITY, UTAH.—The City Council is contemplating remodeling the municipal electric-light plant.

CASPER, WYO.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until May 29 for the construction, including mechanical equipment, interior lighting fixtures and approaches, of the United States post office in Casper. Drawings and specifications may be obtained at the above office or from the custodian of site at Casper. O. Wenderoth is supervising architect.

Canada

CAMROSE, ALTA.—The by-law providing for extensions to the municipal electric-light plant has been approved by the municipal Council.

EDMONTON, ALTA.—The City Council has passed the by-law providing $120,693 for extensions to the light and power system and $61,320 for telephone extensions.

KAMLOOPS, B. C.—Plans have been completed by Ducane & Dutcher, consulting engineers, Rogers Building, Vancouver, for the construction of a power house for the municipal electric-light plant.

KELOWNA, B. C.—The City Council is considering the question of appropriating $16,000 for the installation of a new generating unit in the municipal electric-light plant and $16,000 for additions to the water-works system.

VANCOUVER, B. C.—The City Council has passed an ordinance providing for the installation of cluster lamps on Seymour Street, to cost about $12,560.

FORT GARRY, MAN.—The City Council has passed a by-law authorizing the execution of an agreement between the municipality of Fort Garry and the city of Winnipeg, whereby the latter will furnish electricity for this municipality. Steps have been taken by the city to erect a $40,000 distributing system. Fort Garry has not a post office.

OTTAWA, ONT.—The City Council is considering plans for extension to the electrical station on Laurier Street East, for which new machinery will be required.

TILSONBURG, ONT.—The Council is considering the purchase of an electrically operated pump for the municipal electric plant.

WALLACEBURG, ONT.—The Wallaceburg Gas Co. has submitted a proposal to Mayor Dundas offering to sell its electrical plant for $30,000, on condition that hydroelectric power is connected with its lines by Dec. 31, 1914. The proposition will be submitted to the voters, together with a by-law appropriating $36,000 for equipment for the hydroelectric station. Electricity for operating the system will be secured from the Hydro-Electric Power Commission.

WINDSOR, ONT.—The Hydro-Electric Power Commission, it is reported, is contemplating the purchase of 2000 cedar poles, 25 ft. to 50 ft. long. D. Bowlby, 322 Sandwich Street West, Windsor, is chairman of commission.

WINDSOR, ONT.—Contracts have been awarded for the substations in Windsor and Walkerville for the Hydro-Electric Power Commission system. The contract for the Windsor station was secured by H. J. Christman, of Hamilton, at $10,000, and the Walkerville station was given to Wells & Gray, of Windsor, for $9,650.

LAKE MEGANTIC, QUE.—The Municipal Council has accepted plans prepared for the installation of a hydroelectric power plant, to cost about $150,000. E. A. Evans, 92 St. Peter Street, Quebec, is engineer in charge.

KAMSACK, SASK.—Tenders will be received by A. A. Crawford, secretary and treasurer, Kamsack, until May 13 for the following work: (A) For laying watermains and sewers: (B) power house and filter house; (C) furnishing material and erecting water tower; (D) cast-iron pipe; (E) fire hydrants and valves; (F) furnishing and installing pressure filters; (G) pumping machinery; (H) boilers; (J) steam engine; (K) generator; (R) furnishing material and constructing concrete reservoir; (S) sewer pipe; (X) furnishing material and construction of sewage-disposal works. Alternative bids will be received for gas producers and engines in place of boilers and steam engine of same capacity. Plans and specifications may be seen at the office of Chipman & Power, engineers, Toronto, Ont., and Winnipeg, Man.

SASKATOON, SASK.—By-laws are being advertised in Saskatoon to provide for loan on debentures in the sum of $200,000 for extensions to the municipal electric light and power plant as follows: For erection of new power house and purchase of site for same, $15,000 and $85,000 for extension to the electric light and power system.

Miscellaneous

JUNEAU, ALASKA.—The City Council has granted the Juneau-Douglas Tel. Co. a franchise to install a telephone system here.

JUNEAU, ALASKA.—The Alaska El. Lt. & Pwr. Co., of Juneau, expects to erect within the next six months a new power house and a 10,000-barrel oil tank for fuel oil; also to purchase a new 250-hp boiler and ½ mile of pipe (24-in. to 32 in. in diameter) and the usual amount of supplies to maintain plant. E. J. Margrie is manager.

New Incorporations

DOVER, DEL.—The South Kentucky Pwr. Co. has filed articles of incorporation under the laws of the State of Delaware, with a capital stock of $100,000. The incorporators are F. D. Buck, G. W. Dillman and M. L. Horty, of Wilmington. The company proposes to operate power plants, street railways, etc.

MARION, ILL.—The Ohio Valley El. Co. has been incorporated by E. H. Wykes, E. Lewis and E. T. Gallagher. The company is capitalized at $2,500 and proposes to construct and operate an electric light and power plant and transmission lines, etc. Dennison & Spiller, of Marion, are attorneys.

KINGSTON, N. Y.—The Kingston-Ellenville Trackless Trolley Co. has been incorporated with a capital stock of $5,000 by John Purce, 27 East Twenty-first Street, Paterson, N. J.; George J. Giger and Frank Leonard, of Paterson, N. J.

WAYNESBORO, MISS.—The Waynesboro Electrical Co. has been incorporated with a capital stock of $30,000 by C. C. Green, O. R. Green and J. Legett.

DALLAS, TEX.—The Belmont El. Co. has been organized with a capital stock of $5,000 by J. A. Sanders, H. W. Broure, and E. W. Morton, Jr. The company proposes to construct electric street and suburban railways and belt railways in and around Dallas.

BRANDON, VT.—The Hortonia Pwr. Co. has been incorporated with a capital stock of $50,000 by Edward D. Blackwell, Frank E. Chandler, of Brandon; A. G. Stone and A. W. Hyde, of Sudbury, and others. The company proposes to build a power plant in Hortonville. The office of the company is in Brandon.

SOUTH BEND, WASH.—The Willapa Pwr. Co. has been incorporated with a capital stock of $1,000,000, by Williamson S. Summers, Frank Mackean, M. R. Harriman, Lane Summers, C. R. Harold, Percy J. Perry, R. Stafford, S. Samuel C. Slaughter, of Seattle, Wash., and Frank Balcon, of Grand View.

RIGAUD, QUE., CAN.—The Rigaud El. & Milling Co. has been incorporated with a capital stock of $149,000 by J. A. Bourbeau, A. Mercier and J. Lafleur.

Directory of Electrical Associations, Societies, Etc.

ALABAMA LIGHT AND TRACTION ASSOCIATION. Secretary-treasurer, H. O. Hanson, Mobile Gas Co., Mobile, Ala. Semi-annual meeting, Mobile, Ala., May, 1914.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE. Permanent secretary, L. O. Howard, Smithsonian Institution, Washington, D. C.

AMERICAN ELECTRIC RAILWAY ACCOUNTANTS' ASSOCIATION. Secretary-treasurer, E. B. Burritt, 29 West 39th St., New York.

AMERICAN ELECTRIC RAILWAY ASSOCIATION. Secretary, E. B. Burritt, 29 West 39th St., New York.

AMERICAN ELECTRIC RAILWAY ENGINEERING ASSOCIATION. Secretary, E. B. Burritt, 29 West 39th St., New York.

AMERICAN ELECTROCHEMICAL SOCIETY. Secretary, Prof. J. W. Richards, Lehigh University, South Bethlehem, Pa.

AMERICAN ELECTRO-THERAPEUTIC ASSOCIATION. Secretary, Dr. J. Willard Travell, 27 East 11th St., New York.

AMERICAN INSTITUTE OF CONSULTING ENGINEERS. Secretary, Eugene W. Stern, 101 Park Ave., New York City.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Secretary, F. L. Hutchinson, 33 West 39th St., New York. Board of directors meets monthly. Sections and branches in the principal electrical centers throughout the country. Annual meeting, Detroit, Mich., June 23-25, 1914.

AMERICAN PHYSICAL SOCIETY. Secretary, Prof. A. D. Cole, Ohio State University, Columbus, Ohio.

AMERICAN SOCIETY OF REFRIGERATING ENGINEERS. Secretary, William H. Ross, 154 Nassau St., New York City.

AMERICAN SOCIETY FOR TESTING MATERIALS. Secretary-treasurer, Edgar Marburg, University of Pennsylvania, Philadelphia.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS. Secretary, Edwin A. Scott, 29 West 39th St., New York.

AMERICAN WATER WORKS ASSOCIATION. Secretary, J. M. Diven, 47 State St., Troy, N. Y. Annual meeting, May.

ARKANSAS ASSOCIATION OF PUBLIC UTILITY OPERATORS. Secretary, W. J. Tharp, Little Rock, Ark.

ASSOCIATION OF EDISON ILLUMINATING COMPANIES. Secretary, Geo. C. Holberton, Pacific Gas & Electric Co., San Francisco, Cal.

ASSOCIATION OF IRON AND STEEL ELECTRICAL ENGINEERS. Secretary, W. T. Snyder, McKeesport, Pa.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS. Secretary-treasurer, Jos. A. Andreucetti, Chicago & Northwestern Railway, Chicago.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS. Secretary, P. W. Drew, 112 West Adams St., Chicago. Annual meeting, New Orleans, May 19-22.

CALIFORNIA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, W. S. Hanbridge, 1408 Merchants' National Bank Building, Los Angeles, Cal.

CANADIAN ELECTRICAL ASSOCIATION. Affiliated with N. E. L. A. Secretary-treasurer, J. H. Larmonth, 610 Confederation Life Bldg., Toronto, Can.

COLORADO ELECTRIC CLUB. Secretary, C. F. Oehlmann. Meets every Thursday at Albany Hotel, Denver, Col.

COLORADO ELECTRIC LIGHT, POWER AND RAILWAY ASSOCIATION. Secretary-treasurer, T. F. Kennedy, 900 15th St., Denver, Col.

COMMERCIAL SECTION, N. E. L. A. Secretary J. F. Becker, 1170 Broadway, N. Y.

EASTERN NEW YORK SECTION, N. E. L. A. Secretary, C. S. Van Dyck, Schenectady, N. Y.

ELECTRIC CLUB OF CHICAGO. Secretary, Fred M. Rosseland, Monadnock Block, Chicago. Meets every Thursday noon at Hotel Sherman.

ELECTRICAL CONTRACTORS' ASSOCIATION OF GREATER BOSTON. Secretary, R. S. Hale, 39 Boylston St., Boston.

ELECTRICAL CONTRACTORS' ASSOCIATION OF MASSACHUSETTS. Secretary, H. D. Temple, 30 Foster St., Worcester, Mass.

ELECTRICAL CONTRACTORS' ASSOCIATION OF NEW YORK STATE. Secretary, Geo. W. Russell, Jr., 25 West 42d St., New York.

ELECTRICAL CONTRACTORS' ASSOCIATION OF THE CITY OF CHICAGO. Secretary, M. N. Blumenthal, 179 West Washington St. Meets at noon on the second and fourth Wednesday of each month at 424 South Wabash Ave.

ELECTRICAL CONTRACTORS' ASSOCIATION OF STATE OF MISSOURI. Secretary, A. J. Burns, 318 West Tenth St., Kansas City, Mo.

ELECTRICAL CONTRACTORS' ASSOCIATION OF WISCONSIN. Secretary, Albert Petermann, 626 Lloyd St., Milwaukee, Wis.

ELECTRICAL CREDIT ASSOCIATION OF CHICAGO. Secretary, Frederic P. Vose, 1343 Marquette Building, Chicago.

ELECTRICAL CREDIT ASSOCIATION OF PHILADELPHIA. Secretary, John W. Crum, 1324 Land Title Building, Philadelphia, Pa.

ELECTRICAL SALESMEN'S ASSOCIATION. Secretary, Francis Raymond, 225 Michigan Ave., Chicago, Ill.

ELECTRICAL SUPPLY JOBBERS' ASSOCIATION. General secretary, Franklin Overbagh, 411 South Clinton St., Chicago, Ill. Next meeting Atlantic City, N. J., May 12-14.

ELECTRICAL TRADES ASSOCIATION OF CANADA. Secretary, William R. Stavely, Royal Insurance Building, Montreal, Can.

ELECTRICAL TRADES ASSOCIATION OF THE PACIFIC COAST. Secretary, Albert H. Elliott, Harding Building, 34 Ellis St., San Francisco, Cal. Meeting, San Francisco, second Thursday of each month.

ELECTRIC VEHICLE ASSOCIATION OF AMERICA. Executive secretary, A. Jackson Marshall, United Engineering Societies Building, 29 West 39th St., N. Y. Sections in New England, Chicago, Philadelphia and Washington.

EMPIRE STATE GAS AND ELECTRIC ASSOCIATION. Secretary, Charles H. B. Chapin, 29 West 39th St., New York.

FARADAY ELECTRICAL ASSOCIATION. Secretary, W. J. Collins, 1129 Masonic Temple, Chicago. Meets at noon on the first and third Wednesday of each month at Planters' Hotel.

GAS, ELECTRIC AND STREET RAILWAY ASSOCIATION OF OKLAHOMA. Secretary-treasurer, Prof. H. V. Bozell, Norman, Okla. Annual meeting, May 13-15, 1914.

HYDROELECTRIC SECTION, N. E. L. A. Secretary, S. A. Sewall, 29 West 39th St., N. Y.

ILLINOIS STATE ELECTRICAL ASSOCIATION. Secretary, H. E. Chubbuck, Peoria, Ill.

ILLUMINATING ENGINEERING SOCIETY. General secretary, J. D. Israel, Engineering Societies Building, 29 West 39th St., New York. Sections in New York, New England, Philadelphia, Chicago and Pittsburgh.

INDEPENDENT ELECTRICAL CONTRACTORS' ASSOCIATION OF GREATER NEW YORK. Secretary, A. Newburger, 1153 Myrtle Ave., Brooklyn, N. Y.

INDEPENDENT TELEPHONE ASSOCIATION OF AMERICA. Secretary, W. S. Vivian, Grand Rapids, Mich.

INDIANA ELECTRIC LIGHT ASSOCIATION. Secretary, Thomas Donahue, Lafayette, Ind.

INSTITUTE OF OPERATING ENGINEERS. Secretary, L. Houmiller, 29 West 39th St., New York.

INSTITUTE OF RADIO ENGINEERS. Secretary, E. J. Simon, 81 New St., New York.

INTERNAL COMBUSTION ENGINEERS' ASSOCIATION. President, Charles Kratsch, 416 West Indiana St., Chicago. Meeting second Friday of each month at Lewis Institute.

INTERNATIONAL ASSOCIATION OF MUNICIPAL ELECTRICIANS. Secretary, C. R. George, Houston, Tex.

INTERNATIONAL ELECTRICAL CONGRESS. Secretary-treasurer, Preston S. Millar, 80th St. and East End Ave., New York. Congress, San Francisco, Sept. 13-18, 1915.

INTERNATIONAL ENGINEERING CONGRESS. Secretary-treasurer, W. A. Cattell, Foxcroft Building, San Francisco, Cal. Congress, San Francisco, September, 1915.

INTERNATIONAL ELECTROTECHNICAL COMMISSION (international body representing various national electrical engineering societies contributing to its support). General secretary, C. le Maistre, 28 Victoria St., Westminster, London, S. W., England. Meeting at San Francisco, Sept. 6-11, 1915.

IOWA ELECTRICAL ASSOCIATION. Affiliated with N. E. L. A. Secretary, H. B. Maynard, Waterloo, Ia.

IOWA STREET AND INTERURBAN RAILWAY ASSOCIATION. Secretary, H. E. Weeks, Davenport, Ia.

JOVIAN ORDER. Jupiter (president), W. N. Matthews, St. Louis, Mo.; Mercury (secretary), E. C. Bennett, Syndicate Trust Building, St. Louis, Mo.

KANSAS GAS, WATER, ELECTRIC LIGHT AND STREET RAILWAY ASSOCIATION. Secretary-treasurer, Ivor Thomas, 237 South Main St., Wichita, Kan.

LOUISIANA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, J. J. Ziegler, 227 Bourbon St. Meeting every Wednesday, Audubon Building, New Orleans.

MAINE ELECTRIC ASSOCIATION. Secretary-treasurer, Walter S. Wyman, Waterville, Maine.

MICHIGAN ELECTRIC ASSOCIATION. Affiliated with N. E. L. A. Secretary, Herbert Silvester, 18 Washington Boulevard, Detroit, Mich. Annual convention, Detroit-Thousand Islands, June 17.

MINNESOTA ELECTRIC ASSOCIATION. Secretary-treasurer, F. A. Otto, St. Paul Gas Light Company, St. Paul, Minn.

MISSISSIPPI ELECTRIC ASSOCIATION. Affiliated with the National Electric Light Association. Secretary-treasurer, Frank J. Duffy, Natchez, Miss.

MISSOURI ELECTRIC, GAS, STREET RAILWAY AND WATER WORKS ASSOCIATION. Secretary-treasurer, F. D. Beardslee, Union Electric Light & Power Co., St. Louis. Annual meeting, May 21-23.

NATIONAL ARM, PIN AND BRACKET ASSOCIATION. Secretary, J. B. Magers, Madison, Ind.

NATIONAL ASSOCIATION OF ELECTRICAL INSPECTORS. Secretary-treasurer, Wm. L. Smith, Concord, Mass.

NATIONAL DISTRICT HEATING ASSOCIATION. Secretary, D. L. Gaskill, Greenville, Ohio. Annual convention, Rochester, N. Y., May 26-28.

NATIONAL ELECTRIC LIGHT ASSOCIATION. Executive secretary, T. C. Martin, Engineering Societies Building, 33 West 39th St., New York. Annual meeting, Philadelphia, June 1-5.

NATIONAL ELECTRICAL CONTRACTORS' ASSOCIATION OF THE UNITED STATES. Secretary, George H. Duffield, 41 Martin Building, Utica, N. Y.

NATIONAL ELECTRICAL CREDIT ASSOCIATION. Secretary, Frederic P. Vose, 1343 Marquette Building, Chicago. Annual meeting, June, 1914.

NATIONAL FIRE PROTECTION ASSOCIATION. Secretary of electrical committee, Ralph Sweetland, 141 Milk St., Boston, Mass. Open meeting, New York, March, 1915.

NATIONAL INDEPENDENT TELEPHONE ASSOCIATION. Secretary-treasurer, J. B. Earle, Waco, Tex.

NEBRASKA SECTION, N. E. L. A. Secretary-treasurer, S. J. Bell, David City, Neb.

NEW ENGLAND ELECTRICAL CREDIT ASSOCIATION. Secretary, Alton F. Tupper, 60 State St., Boston, Mass. Directors meet first Wednesday of each month.

NEW ENGLAND SECTION, ELECTRIC VEHICLE ASSOCIATION OF AMERICA. Secretary, L. L. Edgar, 39 Boylston St., Boston, Mass.

NEW ENGLAND STREET RAILWAY CLUB. Secretary, H. A. Faulkner, 12 Pearl St., Boston, Mass. Meets last Thursday of each month.

NEW ENGLAND SECTION, N. E. L. A. Secretary, Miss O. E. Bursiel, 149 Tremont St., Boston, Mass. Annual meeting, Narragansett Pier, R. I., Sept. 2-4.

NEW ORLEANS ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, S. J. Stewart, 312 Carondelet St., New Orleans, La. Meetings, second and fourth Tuesday of each month.

NEW YORK ELECTRIC RAILWAY ASSOCIATION. Secretary, Charles C. Dietz, 239 W. 39th St., New York.

NEW YORK ELECTRICAL CREDIT ASSOCIATION. Affiliated with the National Electrical Credit Association. Secretary, Franz Neilson, 80 Wall St., New York.

NEW YORK ELECTRICAL SOCIETY. Secretary, G. H. Guy, 33 West 39th St., New York. Annual meeting, New York, June, 1914.

NORTHWEST SECTION N. E. L. A. Secretary, N. W. Brockett, Pioneer Building, Seattle, Wash.

NORTHWESTERN CEDARMEN'S ASSOCIATION. Secretary, R. N. Boucher, 743 Lumber Exchange, Minneapolis, Minn.

OHIO ELECTRIC LIGHT ASSOCIATION. Secretary, D. L. Gaskill, Greenville, Ohio.

OHIO SOCIETY OF MECHANICAL, ELECTRICAL AND STEAM ENGINEERS. Secretary, Prof. F. E. Sanborn, Ohio State University, Columbus, Ohio.

OREGON ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, F. C. Green, 291 East Morrison St., Portland, Ore. Annual meeting, Portland, June 8-9.

PENNSYLVANIA ELECTRIC ASSOCIATION (State Section N. E. L. A.). Secretary-treasurer, S. C. Pohe, Bloomsburg, Pa.

RAILWAY SIGNAL ASSOCIATION. Secretary-treasurer, C. E. Rosenberg, Times Building, Bethlehem, Pa.

SOCIETY FOR ELECTRICAL DEVELOPMENT, INC. General manager, J. M. Wakeman, 29 West 39th St., New York. Annual meeting, New York, May 12.

SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION. Secretary, Prof. H. H. Norris, Ithaca, N. Y. Annual meeting, Princeton, N. J., June.

SOUTHEASTERN SECTION, N. E. L. A. Secretary-treasurer, A. A. Wilbur, Columbus, Ga. Annual meeting, Isle of Palms, Charleston, S. C., Aug. 19-21, 1914.

SOUTHWESTERN ELECTRICAL AND GAS ASSOCIATION. Secretary, H. S. Cooper, 405 Slaughter Building, Dallas, Tex. Annual convention, Galveston, Tex., May 20-23.

VERMONT ELECTRICAL ASSOCIATION. Secretary-treasurer, A. B. Marsden, Manchester, Vt.

WESTERN ASSOCIATION OF ELECTRICAL INSPECTORS. Secretary, W. S. Boyd, 76 West Monroe St., Chicago, Ill.

WESTERN SOCIETY OF ENGINEERS, ELECTRICAL SECTION. Secretary, J. H. Warder, 1737 Monadnock Block, Chicago.

WISCONSIN ELECTRICAL ASSOCIATION. Secretary, George Allison, 1410 First National Bank Bldg., Milwaukee, Wis.

Weekly Record of Electrical Patents

UNITED STATES PATENTS ISSUED APRIL 21, 1914.

[Prepared by Robert Starr Allyn, 16 Exchange Place, New York, N. Y.]

1,093,594. Phase Balancer; E. F. W. Alexanderson, Schenectady, N. Y. App. filed June 20, 1912. For polyphase transmission systems.

1,093,596. Electric Block-Signal Apparatus; J. Beaumont and F. G. White, Chicago, Ill. App. filed March 21, 1912. For use at main track and side track.

1,093,597. Electric Block-Signal Apparatus; J. Beaumont and F. G. White, Chicago, Ill. App. filed March 21, 1912. For side-tracking switch.

1,093,607. Junction Box for Electrical Conductors; C. W. Davis, Edgeworth, Pa. App. filed March 24, 1909. Distributing box.

1,093,614. Brush for Dynamo-Electric Machines; E. G. Gilson, Schenectady, N. Y. App. filed Jan. 29, 1913. Molded mass of copper, graphite, tin and more than a trace of iron.

1,093,615. Circuit for Electric Lighting or Power; M. H. Gray, Springfield, Ohio. App. filed Nov. 5, 1912. Internal-combustion storage-battery system.

1,093,621. Indicator; A. B. Hazard, Chicago, Ill. App. filed June 22, 1911. For indicating the operation of a switch, mail box, etc., at a distant point.

1,093,622. Automatic Switch and Locking Device for Lever Control of Steering Posts; R. Herman, Crafton, Pa. App. filed March 8, 1910. For locking the control levers in zero position with ignition circuit interrupted.

1,093,634. Brush Holder; A. Krauss, Cannstatt, Germany. App. filed May 23, 1911. For distributers of multi-cylinder engines.

1,093,650. Electric Generator or Motor; W. Rodgers, Hamilton, Ontario, Canada. App. filed Sept. 13, 1913. Dovetailed plates for securing laminations to frame.

1,093,670. Motor-Control System; M. A. Whiting, Schenectady, N. Y. App. filed Jan. 18, 1913. Electric motor and its control apparatus; protects against overload.

1,093,679. Auxiliary Alarm System; C. E. Beach, Binghamton, N. Y. App. filed June 30, 1913. Improved annunciator system.

1,093,702. Relay; I. Kitsee, Philadelphia, Pa. App. filed March 31, 1911. Polarized relay of moving coil type.

1,093,717. Rectifier of Electric Currents; T. J. Murphy, Rochester, N. Y. App. filed July 24, 1908. Has rotating electrodes.

1,093,754. Expansion Member for Electric Heating Devices; H. P. Ball, Pittsfield, Mass. App. filed Dec. 14, 1912. Heating units mounted in sheet-metal portions.

1,093,791. Electric Flatiron; C. P. Madsen, Chicago, Ill. App. filed Sept. 26, 1912. Has quick make-and-break push-button switch in the handle thereof.

1,093,792. Armored Electric Heating Unit; C. P. Madsen, Chicago, Ill. App. filed Feb. 3, 1913. Heating unit covered with wrapping of fireproof fibrous material incased in a continuous layer of powdered silica.

1,093,793. Electric Switch; J. F. McElroy, Albany, N. Y. App. filed. Aug. 11, 1911. Double-throw type.

1,093,794. Telephone Signal System; J. Meyerhoff, Chicago, Ill. App. filed Nov. 15, 1912. Connections made without any conversation between the user and the exchange operator.

1,093,801. Signal System; G. W. Phelps, Chicago, Ill. App. filed April 24, 1913. For bank cashiers.

1,093,803. Combined Telephone-Mouthpiece Guard and Advertising Device; G. Ross, Chicago, Ill. App. filed March 14, 1913. Hinged cover which may be lowered over the mouthpiece to exclude local talk.

1,093,809. Lock Construction; H. G. Voight, New Britain, Conn. App. filed April 17, 1913. With annunciator to indicate when the bolt is projected or retracted.

1,093,810. Lock Mechanism; H. G. Voight, New Britain, Conn. App. filed April 19, 1913. Aununciator indicates time elapsing between retraction of bolt by a particular key and the subsequent projection of said bolt.

1,093,857. Electric Igniting Device for Explosive Engines; L. C. Jackson, Buffalo, N. Y. App. filed May 16, 1906. Make-and-break igniter.

1,093,875. Electromagnetic Separator; B. T. Mottinger, Youngstown, Ohio. App. filed Aug. 4, 1913. Materials passed through openings in pole plates.

1,093,888. Current-Amplifying Apparatus and Circuits; H. E. Shreeve, Millburn, N. J. App. filed Aug. 20, 1912. Repeater apparatus for amplifying wireless signals.

1,093,893. Mounting for Fuses; C. G. Stoll, Brooklyn, N. Y. App. filed April 1, 1907. Has tubular porcelain shell.

1,093,926. Signaling System; R. H. Gaylord, Pasadena, and G. B. Capps, Los Angeles, Cal. App. filed April 28, 1913. For elevators.

1,093,947. Unit and Process of Making the Same; M. H. Rice, New Rochelle, N. Y. App. filed Oct. 1, 1913. Passes current through a carbon rod placed in powdered enamel contained in protective casing so as to fuse the enamel to said rod.

1,093,951. Case and Cap for Telephone Receivers; L. Steinberger, Brooklyn, N. Y. App. filed Jan. 13, 1913. Reinforcing rings on the receiver case and cap.

1,093,955. Combination Sash Lock and Alarm; J. Tregoning, New Haven, Conn. App. filed Nov. 27, 1912. Alarm given when sash is opened more than the predetermined extent.

1,093,957. Electrode; E. Weintraub, Lynn, Mass. App. filed April 6, 1912. Carbon, calcium cyanamide, titanium oxide and rutile.

1,093,968. Electric Furnace; R. S. Bicknell, New York, N. Y. App. filed Oct. 25, 1913. Non-metallic resistors; resistance varied by changing path of current.

1,093,972. Wire Connector; W. C. Cady, Middletown, Conn. App. filed July 11, 1913. Spring-pressed clamping plate retracted by pressure on exposed buttons.

1,093,983. Repulsion-Motor Control; F. Eichberg, Berlin, Germany. App. filed Nov. 18, 1911. Reversal obtained by shifting the brushes while maintaining the proper phase relations.

1,093,997. Conducting Seal for Vacuum Containers; C. A. Kraus, Newton Highlands, Mass. App. filed April 5, 1912. Tube of conducting material sealed through the container wall.

1,094,030. Electric Fuse; S. D. Sprong and W. E. McCoy, New York, N. Y. App. filed Sept. 6, 1912. U-shaped fuse strips for controlling two circuits.

1,094,036. Fuse Plug; S. Terada, Seattle, Wash. App. filed May 22, 1913. Fuse cartridge insertible in body of plug.

1,094,051. Ignition Device; J. Berg, Chicago, Ill. App. filed Sept. 18, 1912. For lighting cigars.

1,094,073. Controlling Device for Subsequently Identifying Persons at a Business Negotiation and the Like. A. Ilg, Zurich, Switzerland. App. filed March 25, 1913. Time stamp closes circuit through camera, which takes an identifying photograph of the person involved in the transaction.

1,094,077. Variable-Speed Dynamo; H. Leitner, London, England. App. filed April 11, 1912. For train lighting.

1,094,083. Electric Sign; A. C. Meyer, San Diego, Cal. App. filed Oct. 23, 1912. Flasher and sign changer.

1,094,102. Repulsion Motor; A. Simon, Milwaukee, Wis. App. filed Nov. 29, 1907. Electromotive force of one or both sets of displaced primary coils varied to change the angular position of the primary flux.

1,094,103. Automatic Block Signaling System for Electric Railways; O. E. Stevens, New York, N. Y. App. filed Nov. 3, 1908. Rails conductively continuous to propulsion current with cross bonds at ends of blocks.

1,094,104. Automatic Block Signaling System for Electric Railways; O. E. Stevens, New York, N. Y. App. filed Dec. 31, 1908. Employs a reactance device consisting of a magnetic core, a fixed coil and a movable coil.

1,094,106. Electromagnetic Fishing Tool; C. N. White, Maricopa, Cal. App. filed Dec. 23, 1912. For recovering drilling tools from a well.

1,094,109. Conduit; C. J. Alpaugh, Trenton, N. J. App. filed July 29, 1913. Sheet-metal trough and cover.

1,094,121. Resistance Unit for Controllers; H. W. Cheney, Milwaukee, Wis. App. filed Oct. 6, 1909. Heat-dissipating means for compression resistances.

1,094,125. Magnetic Separator; R. W. Cousins, Chicago, Ill. App. filed Sept. 11, 1908. For treating comminuted cinder and flue dust from blast furnaces.

1,094,137. Contact-Shoe Device for Third-Rail Systems; H. S. Farquhar, Bryn Mawr, Pa. App. filed Aug. 14, 1912. Contact shoe automatically thrown out of or into operative position.

1,094,141. Process of Electric Welding; G. Gnüchtel, Lauter, Germany. App. filed Jan. 15, 1913. Places an intermediate layer requiring a higher welding heat between the electrodes and the parts to be welded.

1,094,156. Battery Regulator; E. Lowe, New York, N. Y. App. filed July 26, 1913. Regulating resistance for telephonic outfits used by the deaf.

1,094,170. Bell Ringer; J. E. Scovill, Chicago, Ill. App. filed Sept. 13, 1911. Electromagnetically released trigger locks hammer in retracted position.

1,094,173. Battery Terminal; J. M. Skinner, Philadelphia, Pa. App. filed Nov. 16, 1912. Annular flanges on terminal prevent creeping of electrolyte.

1,094,206. Pull Socket; C. R. Hare, Hartford, Conn. App. filed Dec. 18, 1913. Shell lining is bulged outward adjacent to chain slot to provide clearance.

1,094,224. Process for Producing 1, 3-Diols; L. P. Kyriakides and R. B. Earle, Cambridge, Mass. App. filed Dec. 21, 1912. Electrolytic reduction of ketone-alcohols in acid media.

1,094,238. Electrically Driven Pendulum; G. Nobis, Davenport, Ia. App. filed June 2, 1913. T-shaped circuit-breaker swung by the pendulum.

1,094,292. System for Operating or Controlling Time-Indicating Devices; L. J. Aron, London, England. App. filed May 17, 1912. Master and secondary clock system.

1,094,352. Refractory Fibrous Material and Process of Making the Same; E. Weintraub and F. A. Kroner, Lynn, Mass. App. filed May 2, 1913. Contains silicon, carbon and oxygen; for heat insulating purposes.

1,094,354. Electric Furnace and Process of Heating Substances; E. F. Von Wilmowsky (deceased), Boston, Mass. App. filed Oct. 28, 1896. Produces a "traveling" or an "oscillating" arc.

1,094,355. Electric Furnace and Process of Heating Substances Uniformly and at a Controllable Temperature; E. F. Von Wilmowsky (deceased), Boston, Mass. App. filed Oct. 28, 1896. Magnetic field disperses or spreads the arc, and a current of gas is led past the arc.

1,094,356. System of Automatic Block Signaling for Electric Railways; S. M. Young, New York, N. Y. App. filed Feb. 8, 1906. Traffic rails divided in blocks and bonded to form separate returns for propulsion current.

1,094,362. Thermostat; J. Boekel, Philadelphia, Pa. App. filed Feb. 12, 1913. One contact floated on a mercury column and partly immersed therein.

1,094,371. Process for Extracting Metals from Ores; H. S. MacKay, Norwich, Conn. App. filed April 16, 1913. Extracts copper by roasting in presence of sulphur, leaching and electrolyzing.

1,094,381. Electric Furnace for and Process of Heating Substances Uniformly and at a Controllable Temperature in an Electric Arc; E. F. Von Wilmowsky (deceased), Boston, Mass. App. filed Oct. 28, 1896. Passes the substance through a diffused electric heating discharge.

1,094,389. Electric Motor; W. K. Howe, Rochester, N. Y. App. filed Aug. 8, 1911. Parts are cased in to prevent entry of foreign material between stator and rotor.

1,094,407. Means for the Regulation or Control of Railway and Like Traffic; H. Von Kramer, Birmingham, England. App. filed Feb. 5, 1913. Line wire parallel to track and inductive frame carried by vehicle.